

PROCEEDINGS OF THE LINNEAN SOCIETY OF LONDON

153rd Session (1940-41)

Part 3

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PROCEEDINGS OF THE LINNEAN SOCIETY OF LONDON

153rd Session (1940-1)

Part 3

PROCEEDINGS OF THE GENERAL MEETING

19 June 1941

Dr. E. S. RUSSELL, O.B.E., M.A., President,
in the Chair

The Proceedings of the Anniversary Meeting, held on Saturday, 24 May 1941, having been circulated, were taken as read and confirmed, after the following had been added to the eighth paragraph,—‘During his inspection of the Ballot-glasses and box, the President wore a three-cornered hat presented by a Fellow of the Society. (See Lt.-Col. A. T. Gage’s History of the Society, 1938, p. 13).’

The thanks of the Society were recorded for gifts made since the last meeting :—From the late Dr. Helena Bandulska, and an anonymous Fellow who had presented a three-cornered hat.

The following Fellows signed the Obligation in the Book of the Charter and Bye-Laws and were admitted :—His Honour H. Drysdale Woodcock, K.C., Dr. Eric Otteleben Callen and Sergeant William Thomas Williams.

Certificates of recommendation of the following candidates for Fellowship were read, for the second time, in favour of the Rev. Alan Richard Tippet and Francis Downes Ommanney.

The Secretaries reported to the meeting that on the instructions of the Council they had attended the Nature Preservation Conference held at noon, 5 June 1941, in the Moses Room, House of Lords. The Conference was of opinion that the Ministry of Works and Buildings should be approached without delay in regard to Nature Reserves in order that adequate provision for the preservation of the wild Flora and Fauna enter into the Minister’s plans for reconstruction after the War. The Conference appointed a Drafting Committee to prepare a statement for submission to the Ministry, the members of the Conference to transmit suggestions to members of the Drafting Committee as soon as possible.

The Botanical Secretary exhibited lantern-slides and photographs of Dovedale on the Derbyshire-Staffordshire border, where a large area of most delightful country is under the administration of ‘The National Trust for Places of Historic Interest and Natural Beauty’, and called

attention to the generosity of the grants made towards its upkeep by the Birmingham Corporation, the Derby Corporation, the City of Stoke-on-Trent and the Staffordshire County Council as evidence of the measure in which this land serves the townsfolk thus represented as a playground. He continued, it is manifest that in the Dovedale property the problem is conspicuously present of 'reconciling the maximum enjoyment of the public with the preservation of the objects upon which that enjoyment so largely depends' (these are words used by the National Trust itself in a memorandum on their work); and, he added, solution of the problem falls on bodies whose outlook differs from that of Corporations and City Councils. He quoted Painter's 'Flora of Derbyshire' (1889) to show that even when the botanist William Henry Purchas was vicar of Alstonfield on the edge of the Dale (1870-1903), some Dovedale plants had already been destroyed by the activities of self-appointed 'guides', although Dovedale was then inaccessible to great numbers of visitors such as now reach it by car or coach; and he said that Dovedale still holds rare and beautiful, even popular, plants preserved by the secrecy with which their exact location is guarded.

He referred in conclusion to the indirect protection a part of the vegetation had had in the past from game preservation and, with game-keepers gone, more direct protection seemed desirable.

After this illustration of the case for representation had been given, the Chair requested that Fellows able to put forward suggestions useful to the Drafting Committee of the Nature Preservation Conference would forward them to the Secretaries of the Linnean Society without delay.

Miss M. S. CAMPBELL, F.L.S., gave a short report on the work of the Phenological Committee of the Royal Meteorological Society, which included an appeal on behalf of Major H. C. Gunton, M.B.E., for help in drawing up the Annual Report of that Committee.

Dr. J. P. HARDING, F.L.S., gave an account of the Cladocera and Copepoda collected from East African Lakes by Miss C. K. Ricardo and Miss R. J. Owen.

Mr. I. H. BURKILL, M.A., Bot.Sec.L.S., gave an account of his paper (the reading of which had been in title at the General Meeting of 3 April 1941) 'The make-up of the flowers of *Ranunculus arvensis* Linn.—a study in evolution of Isomerism in phanerogamous flowers'.

(Discussed by Dr. V. J. Chapman and Dr. B. Barnes; Mr. Burkill replied.) [See p. 214.]

PROCEEDINGS OF THE GENERAL MEETING

10 July 1941

Dr. E. S. RUSSELL, O.B.E., M.A., President,
in the Chair

The Proceedings of the General Meeting, held on Thursday, 19 June 1941, having been circulated, were taken as read and confirmed.

The thanks of the Society were accorded for gifts, made since the last meeting, to Professor Alfred Ernst, Professor W. T. Gordon and Professor F. E. Weiss.

The following candidates were balloted for and elected Fellows :—Dr. Gerald William Thomas Hunter Fleming, Edgar Wolston Bertram Handsley Milne-Redhead, Rev. Alan Richard Tippet and Dr. Francis Downes Ommanney.

The President reported the deaths of Charles Henry Wright, Associate, and Marian, Lady Busk, Fellow of the Society.

The President asked for volunteers from among the Fellows resident in or near London to serve the Society as a Fire Guard by sleeping occasionally at the Society's rooms during the week-ends.

On behalf of Mr. ANTHONY BELT, F.L.S., the Botanical Secretary exhibited an ascidia of the entire leaf of *Spinacia oleracea*, the only one on an otherwise normal plant. There is a figure of such a leaf in the 'Berichte der Deutschen botanischen Gesellschaft' (LII, p. 215; 1934) with an account of the anatomy of the petiole. Dr. B. F. BARNES stated that he had found five such leaves on Spinach in his garden.

On behalf of Mr. C. T. PRIME, F.L.S., two specimens were exhibited of the Foxglove (*Digitalis purpurea*), from Croydon, with a terminal flower cup-like.

A Discussion arranged at the request of the Association for the Study of Systematics in relation to General Biology was then held, under the title, 'Differences in the systematics of plants and animals and their dependence on differences in structure, function and behaviour in the two groups'.

The first speakers in the Discussion were Dr. W. B. TURRILL, Dr. O. W. RICHARDS, Dr. C. D. DARLINGTON, Prof. T. M. HARRIS and Dr. JULIAN S. HUXLEY.

After an adjournment for tea, the Discussion was resumed, with Dr. J. RAMSBOTTOM, Vice-President, in the Chair, the speakers being Mr. C. E. FORD, Dr. K. MATHER, Mr. J. R. NORMAN, Mr. W. J. C. LAWRENCE, Mr. A. J. WILMOTT and Dr. J. RAMSBOTTOM. [Full report follows.]

The Session of 1940-1 was declared closed.

DIFFERENCES IN THE SYSTEMATICS OF PLANTS AND ANIMALS AND THEIR DEPENDENCE ON DIFFERENCES IN STRUCTURE, FUNCTION AND BEHAVIOUR IN THE TWO GROUPS.

(Discussion arranged at the request of the Association for the Study
of Systematics in relation to General Biology.)

Dr. W. B. TURRILL. The discussion which has been arranged for this afternoon is of such wide import that no speaker can do more than consider a fraction of the vast field either by briefly outlining the subject as a whole or by isolating certain parts and treating them rather more fully. I assume that the main object of the discussion is to discover, by means of a comparative synthesis of generally established biological facts, the essential differences between plants and animals, and from them to deduce some of the reasons for differences in systematic treatment of plants and animals respectively. The former differences are numerous and important, the latter are relatively few and of less importance.

The many and fundamentally important resemblances between plants and animals are well known and include the similarity in nuclear structure, the same syngamy-reduction cycle, the same type of Mendelian inheritance and even of many of the same variations within this, and so on. Here, however, we are concerned with differences. In order to get a clear and well-balanced picture of the differences and the problems they raise it is essential to concentrate on general differences and trends, ignoring relatively unimportant, though often interesting, exceptions on one or other or both sides. This means, above all, concentrating on the more highly developed groups and frequently making the final comparison between the Spermatophyta and the Vertebrata. At least there must be left out of our main comparison the Protista in a very broad sense and such groups as the Bacteria and Fungi, which, it might be argued, are only plants if it be insisted that every organism has to be classified as either a plant or an animal. This concentration on main differences in structure, function, and behaviour is methodologically sound and will be pragmatically justified if it enables us to explain some of the differences in taxonomic treatment of plants and animals. Actually it does much more, and much more than there is time even to outline this afternoon.

In preparing this outline introduction to our subject I first listed all the differences I could think of between animals and plants. I then submitted my list to my botanical colleagues at Oxford and to Dr. Huxley and Mr. E. B. Ford among my zoological friends, and to Sir Arthur Hill. I thank these gentlemen for their help and for the additions and modifications they made to my list. I then attempted to classify the differences, to relate them one to another, and finally to summarize the conclusions in a diagram and a table. The result rather surprised me, for I found that the differences between plants and animals (concentrating on the higher divisions of each kingdom and ignoring exceptions) were very numerous, that only a few of them had any obvious significance as reasons for differences in taxonomic theory or practice, and that all of them could be traced to one difference which I was forced to regard as of fundamental importance.

In order not to bias you towards agreement with my own conclusions the collected differences are here given, in what is a purely conventional classification under four main headings :—

I. *Habit and structure.* 1. Plants are rooted in soil or otherwise attached to a substratum, while animals are mobile. There are many exceptions to this in the lower plants (algæ, etc.) and the lower animals (sponges, hydroids, sea-anemones, corals, polyzoa, crinoids, etc.).

2. Plants show radial symmetry, most animals show bilateral symmetry.

3. The cells of plants are separated by walls primarily of cellulose (in the broad sense); later some are modified by impregnation with lignin, suberin, etc. Animal cells have no cellulose walls.

4. There is nothing in plants comparable with the central nervous system in higher animals, and though protoplasmic connecting threads are generally present, recent experimental evidence points more and more to transmission of stimuli in plants by means of hormones.

5. Unisexual individuals are the rule in higher animals, the exception in plants. This is an even more striking difference if allowance be made for the probability or fact that many unisexual plants have had phylogenetically or genealogically not very distant hermaphrodite ancestors. "Sex" is here applied to the sporophyte generation in plants, an application to which a few botanists, for rather academic reasons, may object.

6. Polyploidy is common, and morphologically differentiated sex chromosomes are rare in Spermatophyta; polyploidy is rare and morphologically differentiated sex chromosomes are common, if not the rule, in such animal groups as the birds and mammals.

7. In animals the male gamete is self-motile; in the majority of existing Gymnospermae and in all Angiospermae it is non-motile and there is pollen-tube development.

8. For land plants, a series can be made, and on the whole can be regarded as phylogenetic, showing a gradual reduction of the haploid (gametophytic) generation; there is nothing comparable to this on the animal side.

II. *Growth and development.* 9. Plants have apical meristems, permitting theoretically unlimited growth in length and branching, and cambia with secondary thickening often occur; the higher animals have no apical meristems or cambia, they complete their main growth in length relatively early, and do not branch. Capacity for branching is of great importance in plants, since it allows, in combination with other varying characters, a considerable range of habit and of seasonal behaviour, such as is summated in life-form classifications, and also makes possible vegetative multiplication on a wide scale. In corals, etc., a form of branching and budding occur largely in association with a 'sessile' mode of life. Asexual multiplication is definitely commoner in plants than in animals and is virtually absent in vertebrates.

III. *Physiology and biochemistry*. 10. Plants are autotrophic, absorbing the raw inorganic materials for food manufacture in the gaseous and liquid states and in solution; animals are herbivorous, carnivorous, or saprophagous and take in organic food in a solid or liquid state or in solution.

11. Plants manufacture and store large quantities of carbohydrates, such as sugars, starches, and celluloses, as food reserves or cell walls (cellulose group); animals do not manufacture or store celluloses or deposit them in cell-walls, and fat is the commonest food reserve of the higher animals. Glycogen is stored in the liver.

IV. *Behaviour*. 12. In higher animals there is a wide range in courtship, involving instincts and psychological factors with which there is nothing comparable in plants.

13. Coitus in animals differs from pollination in plants in the need for juxtaposition of male and female individuals.

14. Hybridization is common in plants and is sometimes associated with apomixis, or allopolyploidy may result.

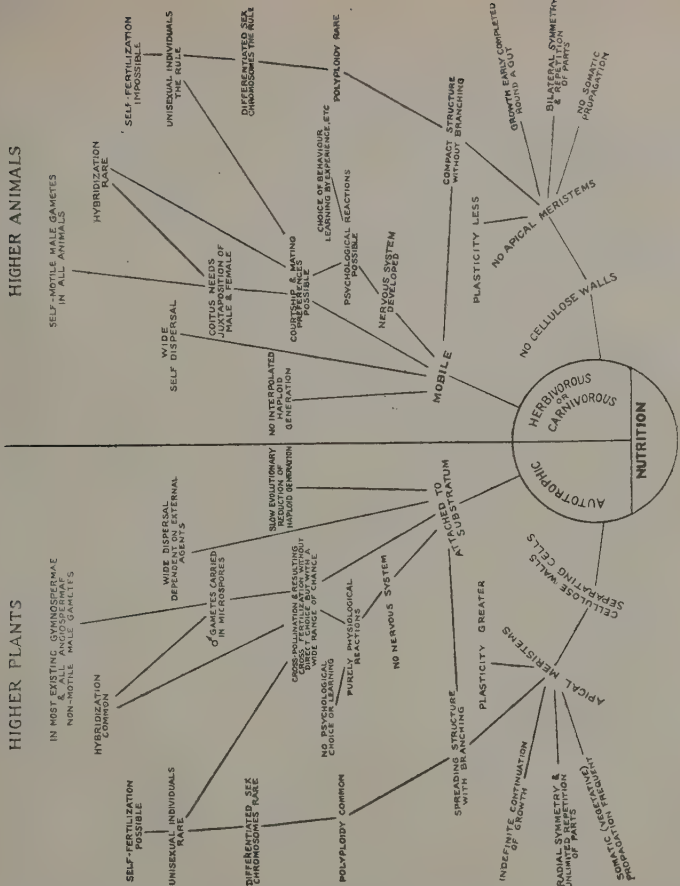
15. Plants, except for short distances, are directly dependent for dispersal on external agencies; higher animals are, in the main, self-dispersed and external agencies as controlling factors act through the organisms themselves.

16. Plants have purely physiological reactions; higher animals, at least, have a degree of choice of behaviour and can learn directly by individual experience. This is true even if one takes an extreme behaviouristic standpoint in psychology—there certainly are such differences however one describes or designates them.

A much fuller consideration of these differences than it is possible to give here has shown that they are not only interconnected in various ways—making alternative classifications logically valid—but that they can all be traced to the one fundamental difference in nutrition—that plants make their food, that animals obtain it ready made. The scheme presented in the figure must not in any way be regarded as phylogenetic, and only to a certain degree does it suggest cause and effect. For the most part the connecting lines are to indicate that without the one structure or behaviour another or others could not occur.

Differences in systematic treatment of higher plants and higher animals. It has been essential to consider the differences between plants and animals at some length before discussing their possible bearing on systematics. We turn now to this aspect, which will be dealt with very briefly in this introduction since it is hoped that other speakers will enlarge upon it.

The resemblances between the systematic treatment of plants by botanists and of animals by zoologists far outweigh the differences. This is due in part to the common characteristics of all living organisms and in part to the historical fact that many of those who first subjected living organisms to scientific and systematic treatment were equally zoologists and botanists. One recalls Aristotle (and his pupils) and Pliny, Linnaeus and Lamarck. The foundation of systematics was laid in unity for plants and animals.



SYSTEMATICS OF HIGHER PLANTS.

Less diversity and complexity of structure and function give narrow range of characters.

Taxonomic units less distinct because of (a) hybridization between taxonomically more or less widely separated units, (b) the use of other criteria additional to intersterility for the separation of species.

Complexities of treatment necessary to include allopolyploids, hybrids, vegetatively propagated populations, and numerous forms due to greater plasticity.

Rarity of relevant fossil evidence in most groups and hence speculative nature of many phylogenetic schemes and their doubtful value in systematics. Relative unimportance of any common ground plan for whole body also makes tracing of phylogeny difficult.

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SYSTEMATICS OF HIGHER ANIMALS.

Greater diversity and complexity of structure and function give wider range of characters.

Taxonomic units more distinct because of (a) much less hybridization, (b) the use of intersterility to separate species.

Less complex treatment necessary because of absence or rarity of allopolyploids, hybrids, and somatically propagated populations and reduced plasticity.

Occurrence of sufficient relevant fossil evidence in many groups and hence greater possible validity of phylogenetic schemes and their greater value in systematics. Presence of a well-marked but complex common ground plan for whole body makes tracing of phylogeny more certain.

The following differences in taxonomic methodology and treatment, of very varied degrees of importance, are suggested in outline as a basis for discussion :—

1. In description, the systematics of the vast majority of the seed-bearing plants (and of some other groups) is based on external gross morphology ; in animals the internal skeleton and internal anatomy are of great importance at all hierarchical levels.

2. In zoology, an important criterion of species distinction is, in theory, the incapacity to breed together to produce fertile offspring. This is sometimes stated very clearly and concisely, as by Dobzhansky. The importance of this genetic criterion is not underestimated by botanists ; but they recognize other causes of specific isolation—separated geographical ranges, different ecological distributions, flowering periods not overlapping, etc.—as equally valid underlying causes of specific distinction. One result of this is that the accepted species of animals are, on the whole, more clear-cut than are those of plants, and interspecific hybrids (except for casual infertile ones) do not occur. Certainly there are few examples recognized taxonomically for animals comparable to the large number of interspecific hybrid swarms now recorded for plants in the wild. The use of the term subspecies for geographical races and of trinomials in their nomenclature is much more extensive in zoology than in botany. A strong argument can be made for the wider use of trinomials in botany, but, I would suggest, before their use is extended, that a thorough analysis of the number of categories which have been and need to be recognized taxonomically should be undertaken. In botany, at least, the need for such an analysis is great and might well reveal the desirability of a wholesale revision of taxonomic categories. For example, there is no doubt that categories of different value are termed 'species', and the same is true for 'subspecies' and 'varieties'. Whether he likes it or not, the taxonomist of the future will have to deal with polyploids within a 'linnaean species', with 'ecotypes', with 'geographical races', with 'physiological races', with 'phases', and so on. How far are such isolates limited to plants or to animals respectively, or to subdivisions within the two kingdoms ? Is any uniform plan of taxonomic treatment, terminology and nomenclature possible or desirable ? These are big questions which it would be rash to answer before a prolonged and co-operative investigation has been made. It is probable that if uniformity of grade were introduced either many animal subspecies would become species or many plant species would become subspecies.

3. Because pollination is by external agents and psychological mating preferences are absent, combined, at least sometimes, with cyto-genetical factors, hybridization is common in plants and occurs at times between units taxonomically widely separated. This is a main factor in causing the reticulation which is a feature of plant taxonomy. In combination with the apical meristematic mode of growth and branching it can lead to allopolyploidy, which may, in a sense, fix and lead to increase in the amount of reticulation. The systematic botanist has, therefore, to be prepared to recognize and deal with a wide range of hybrids and species

or other taxonomic units of hybrid origin. Further, by somatic (vegetative) propagation even potentially segregating or sexually barren hybrids and polyploids may form populations as distinct as and even more constant than those of sexually reproducing species.

4. Because of their apical meristematic growth and less complex structure individuals in plants are more plastic than individuals in higher animals. For the study of taxonomic units at and below the species level in plants experimental taxonomy is more essential than in higher animals.

5. In many more groups of animals than of plants somatic material is such that it, or some important part of it, is preserved as fossils often in large numbers of specimens and in continuous series. Further, in the higher animals, and in many of the invertebrate groups as well, the body shows a much more complex general structural plan than does the soma of higher plants, and it is difficult to conceive of this having been attained polyphyletically. It has resulted that zoologists have a better basis than botanists for making phylogenetic schemes and, with exceptions, have, more than botanists, allowed phylogenetic theories to influence their systematics.

This very general and very incomplete survey is summarized in tabular form in the figure on p. 275. It can only be justified, as, indeed, is true of the whole of our discussion this afternoon, if it arouses sufficient interest to focus sustained attention on practical problems of classification and their theoretical background. It is doubtful if one meeting is sufficient for this, since to achieve our purpose it is essential to do what I deliberately have not done, namely, to consider numerous concrete examples. Perhaps in that blessed time after the war we can stage a fuller discussion for which this meeting may prepare the ground. I should like to close with the remark that a comparison between plants and animals raises problems of evolution of fascinating interest which have not been mentioned here because they bear only indirectly on systematics. Some of these might well be discussed by us in the future.

Dr. O. W. RICHARDS. In all natural populations two opposed processes are at work :—(1) successful crossing, leading to the interchange of genes, and (2) failure to cross, leading to divergence in the average genetic composition of different parts of the population. Both these processes operate to some extent even in the members of a species inhabiting a single heath or wood, and the rate at which they proceed depends chiefly on the size of the natural breeding population of the species. In many animals the population which regularly interbreeds (at any rate over short periods) is one occupying a very small area. Detailed information on this point is still extremely scanty.

It appears that in higher animals the results of genetic divergence are rather rapidly cumulative, so that in them most individuals either cross freely or are not or scarcely capable of interbreeding. The actual way in which effective interbreeding is finally put an end to is probably rather varied, and the stage in the divergence of external characters at which interbreeding ceases is also much more variable than is convenient to the taxonomist. I suspect that in most groups interbreeding ceases

as the result of a cumulative process, but there are clearly some species in which sterility entered at a single step. Polyploidy appears to be relatively rare in animals, but there are other cytological changes which may have the same effect.

These are all grounds for supposing, *a priori*, that 'species' are heterogeneous units, split up after varying amounts of divergence and kept apart in a variety of ways. But while there seem to be good grounds in logic for supposing that species differ in their origin, I think it would be very difficult to deduce this from the taxonomic data. On the whole, the species seems to me to be an unexpectedly uniform unit. Amongst the insects, there are a number of species which appear to reproduce exclusively parthenogenetically without showing any other marked difference from allied bisexual species. Again, some species tend to break up into sharply defined colonies and, though each colony may have a slight taxonomic individuality, it does not appear that such species show any consistent difference from forms with a more uniform distribution. Probably the most evident diversity of type in species of higher animals is in the extent to which geographical races are developed. It is difficult to generalize, but I suspect that this is more often an expression of the wide range and diverse habitats occupied by the species and of the barriers which divide up its area than of anything peculiar in its genetic make-up. The one attribute which seems clearly to militate against geographical differentiation is a wandering or migratory habit not associated with localized breeding areas. Geographical variation does to some extent confuse the taxonomic picture, but races appear to differ from species in degree more than in kind.

In most mammals and birds closely allied forms are geographically separated, and if their ranges meet at all it is usually along a line. In a number of insects quite closely allied species may live in at least the same macro-habitat and sometimes, apparently, very closely intermingled. This appears to be due to differences in the way the sexes find and recognize one another in various groups. I suspect that in plants (apart from species arising by polyploidy) closely allied forms are usually spatially separated, but the much greater amount of hybridization between relatively distinct species is a complication.

What I have said leads to the following impression of the chief contrasts between the species of higher animals and plants :—

Animal species less frequently hybridize, much less often show evidence of arising by polyploidy, are more frequently geographically differentiated. My general impression, which is open to correction, is that most plant and animal species are rather similar units (from the restricted taxonomic viewpoint), but critical genera in which the species are not clear-cut are more frequent in plants. Doubtless non-genetic variation in plants is considerably greater and gives rise to additional difficulties.

Instead of considering the probable mode of origin of species one might rather examine the criteria by which the taxonomist recognizes them. This is the question of the sort of characters in which taxonomic groups differ and the degree of correlation existing between the characters. I do not believe that in the present state of taxonomy a comparative study of specific or generic characters would be very useful. Most

taxonomic work rightly aims at making possible the identification of single dead specimens with the minimum of uncertainty. The characters used are such as the average human biologist finds convenient for this purpose. In the tropical rain forests, the natives recognize a large number of trees by the characters of the trunk. In general, their conclusions agree very well with those of taxonomists. Sometimes they 'lump' a few critical species, but they have also separated species which botanists only later distinguished. A classification drawn up by an insect would clearly rely mainly on chemical and micro-physical characters. The outlines of such a scheme can be deduced from the feeding-habits of phytophagous insects, especially leaf-miners. The classification recognized by insects is essentially similar to ours, though it is certain that the characters used are not those employed at Kew. Until all characters have been studied to a more nearly equal extent, comparisons between different groups are probably undesirable. It is perhaps worth noting, in view of the importance which gene-exchange has in species-formation, how frequently structures connected with reproduction provide useful specific differences in animals. This might be compared with special value of the flower in the classification of plants. In animals such differences are not necessarily more frequent than those in other organs, but they tend to be more clear-cut and to intergrade less.

The correlation of taxonomic characters involves a small point in terminology. When two characters are correlated in the ordinary biometrical sense it implies that changes in some metrical aspect of one character are accompanied by a definite average change in a metrical aspect of the other, e.g. the length of a fish and the number of its vertebrae are pretty closely correlated. When the correlation is sufficiently high it is a matter of convenience which character is actually measured, but the two cannot be used together to confirm a taxonomic proposition. But there is another use of the word correlation, implying that two characters are usually found associated together though without any metrical relation. Thus of our two common bluebottle flies one is larger and has red bristles beneath the eyes. It is not true, however, that the largest specimens have relatively more or redder bristles. This sort of "presence or absence" correlation appears to be essentially a sign of genetic purity (homozygosity) unaccompanied by unusual plasticity. It is possibly true that correlations of this type are more frequent and more easily recognized in animals than in plants, but such questions really require the consideration of committees rather than of individuals.

There is some evidence in insects that the distinction between the two types of correlation breaks down when the characters of the minor (e.g. subspecific) taxonomic units are studied. It is possible that further study of this question might throw light on the beginning of specific divergence.

Dr. C. D. DARLINGTON. The differences in methods of origin of species (and hence in systematics) do not occur between plants and animals as whole groups but between much smaller classes, even classes within genera. For example, in *Paeonia* modern species arose in Europe as

colonizing tetraploids which spread northwards, as the ice retreated, from small diploid groups earlier pushed south into the Mediterranean. In China, on the other hand, with free movement, large diploid groups merely returned north (Barber, in 'Nature', CXLVIII, p. 227 : 1941). Thus the use of the new tetraploid is in releasing variability for new colonization where the diploid has been nearly stamped out. In California again a different method of origin appears in two species of the *Oenothera* type, with chromosome rings of 6, 8 and 10, which reproduce as permanent hybrids (Stebbins and Ellerton, in Journ. Genet., XXXVIII, pp. 1-34; 1939).

Similarly in a larger group, the Diptera, there are two parts, the Nemocera, with crossing-over in the male and no sex chromosomes, and the Brachycera, without crossing-over in the male and with sex chromosomes. *Drosophila* belongs to the second group. Its subdivision into species is finer than the eye can make it. There are many cryptic species never discovered by morphology but quite inter-sterile. The effective agent of this discontinuity may be specificity of mating instinct. Its maintenance, however, depends on sterility of the males in crosses, which in turn is due to sex chromosome unbalance. This method is no doubt characteristic of the one group but excluded in the other (Darlington, 'The Evolution of Genetic Systems', Cambridge, 1939).

The obvious distinction between plants and animals lies in the apparent absence of polyploid species in animals. This does not spring from the failure of polyploidy to occur in them, since triploidy is known in groups as far apart as *Drosophila* and *Triturus* (Fankhauser, in Proc. Amer. Phil. Soc. LXXIX, pp. 715-40; 1938) and tetraploidy in *Pygaera* and *Bombyx*—wherever, indeed, critical observation has been made. Nor does it spring from inability of the X-Y segregation system to work in a new tetraploid, for this has been achieved under experiment in *Bombyx* as well as in the plant *Melandrium* (Westergaard, in Dansk bot. Arkiv, x (5); 1940). Rather it springs from the failure of the new polyploid to maintain itself in organisms without self-fertilization. The tetraploid hermaphrodite plant constitutes at once a potential new species. The tetraploid of a dioecious animal, as Müller pointed out in 1925 (H. J. Müller, in Amer. Nat. LIX, pp. 346-53; 1925), has to cross back to the diploid and must then give a sterile triploid. Polyploids of dioecious animal species are therefore always parthenogenetic. Eight of these are now known in *Daphnia*, *Cypris*, *Artemia*, *Trichoniscus*, *Carausius* and *Solenobia*. Thus analysis can in many ways reveal unsuspected causal relationships, and show us what to look out for in studying a new group of plants or animals.

Prof. T. M. HARRIS. With fossil plants separate organs, rather than whole plants, are the material requiring taxonomic treatment. The 'species' is the unit of the greatest practical importance and is recognized by a discontinuity of variation in one or more characters separating it from other species: smaller units are not used. The 'species' of fossil plant appears to be a fixed entity, progressive evolution not being apparent. The 'genus' or 'form-genus' is a frankly artificial assemblage of species with certain obvious, but not fundamental, characters in common:

it can be readily split into more natural units by the use of further characters. The outstanding systematic differences between fossil plants and animals result (1) from the greater number of characters presented by most fossil animal specimens, which lessen the chance of the genera being very unnatural, and (2) from the gradual evolutionary change occurring both in species and genera of animals, which leads to difficulties in the use of these terms.

Dr. J. S. HUXLEY. I shall confine myself mainly to the question of intra-specific units. Whereas zoologists break down polytypic species into subspecies, botanists, so far as a zoologist can judge, usually think of them as composed of ecotypes. If this difference between plant and animal species is real and general, it is of considerable importance, as it implies that intra-specific differentiation tends to pursue quite different paths in higher plants and higher animals.

Species which show typical geographical subspeciation are not polymorphic (apart from special cases like colour-phases) in the strict sense of containing two or more contrasted types in one area. Their differentiation is spatial, the subspecies having definite areas of distribution and replacing each other geographically. Each subspecies is fairly uniform in characters over its area of distribution. Species which show typical ecotypic differentiation, on the other hand, are polymorphic. Several ecotypes, each adapted to a particular set of ecological conditions, normally co-exist in a given geographical area, and are then sorted out by selection into ecological zones within that area. As in all cases of true polymorphism (R. A. Fisher, 'The Genetical Theory of Natural Selection', Oxford: 1930), there is a selective balance between the various types, the balance being dependent on the range of habitats available, and their respective sizes.

It would appear that geographic subspecies are rare in plants, and ecotypic polymorphism rare in animals. This is doubtless to be correlated with differences in reproduction. The random methods of mating and dispersal found in higher plants will make ecotypic differentiation possible, while it would be very difficult to achieve in higher animals, where the sexes must come together and where the mass-production and mass-dissemination of offspring does not occur.

What is now needed is careful study of intra-specific differentiation in a number of animals and plants, to see how far this basic distinction holds. It is already clear that considerable variation occurs in both kingdoms. Thus, beginning with animals, we find that though geographical subspecies with comparatively large areas of distribution are the rule, at any rate in higher vertebrates, yet ecological (including so-called 'biological races') and genetical subspecies also occur. Genetical subspecies are kept apart by genetical and reproductive barriers. Examples are the two 'races' of *Drosophila pseudo-obscura* (though these should, perhaps, be called semispecies). Polyploidy, as in *Artemia* and certain isopods, produces genetical subspecies of a different type: this type is, of course, much commoner in plants. In all these cases the two forms may overlap, not only in geographical distribution but in habitat. Ecological subspecies are kept apart primarily through

their ecological preferences, though reproductive (psychosexual) barriers may later be established. They may thus come to overlap in geographical distribution, but not in habitat. With them, the principle of ecological replacement is substituted for that of geographical replacement. Ecological (and 'biological') subspecies appear to be much commoner in insects than in vertebrates (O. W. Richards, in *Trans. Roy. Ent. Soc. Lond.* LXXXII, p. 173: 1934), doubtless owing to the refinements of instinctual adaptation in insects. Rensch states that they are common in land snails. Among vertebrates they appear to be commoner in mammals (e.g. *Peromyscus* and other small rodents) than in birds, though they do occur in the latter group (e.g. the rock-pipit, *Anthus spinoletta petrosus*).

Biological races are frequent in parasites, both plant and animal, and in phytophagous insects (W. H. Thorpe, 'Ecology and the Future of Systematics, in 'The New Systematics', ed. J. S. Huxley, Oxford: 1940).

Great differences exist as regards the fineness both of geographical and ecological differentiation, and of the size of the ultimate units. In all cases, except polyploid genetic races, some form of spatial isolation appears to be a pre-requisite for subspeciation in animals. Thus some species show subspecies which are relatively uniform over large areas, while others split up into micro-subspecies or micro-races which may be constituted by colonies of a few hundred individuals. Similarly in ecological differentiation, differentiation may be broadly ecoclimatic, leading to, e.g., altitudinal subspecies, or narrowly ecobiotic, with the production of scores of biological races adapted to different host-plants.

Similar differences occur as regards ecotypic differentiation. At one extreme we get the large-scale 'climatypes', as described, e.g., by Sinskaia (in *Bull. appl. Bot., Leningrad*, xxv, p. 1: 1931) for *Bromus inermis*. The distributional mosaic of types is then superficially similar to that found with ecoclimatic animal subspecies, but is probably brought about by different methods—by adaptation *in situ* in animals, partly at least by selection of mass-disseminated alternative types in plants. The same is probably true for altitudinal ecotypes such as those of *Poa alpina* (Turesson, in *Hereditas*, ix, p. 81: 1927).

At the other extreme we find the small-scale ecotypic differentiation of such forms as *Plantago maritima* (Gregor, in *New Phytolog.* xxxvii, p. 15: 1938, and xxxviii, p. 295: 1939), where a wide range of types is selectively sifted out in adaptation to the range of conditions from saline and muddy to non-saline and dry.

In some cases adaptation is very close and appears to occur *in situ* as with animals, the 'ecotype' then being a true ecological subspecies. This appears to be the case with the sand-dune form of *Hieracium umbellatum* (Turesson, in *Hereditas*, iii, p. 211: 1922). At one spot, where woods come down to the shore, this is absent on the dunes, and Turesson considers that this is due to its delicately adjusted gene-complex being disorganized by crossing with the woodland ecotype. Various approximations to this condition doubtless occur—e.g. probably with the prostrate shingle form of *Cytisus scoparius* and the prostrate cliff form of *Solanum dulcamara* (verbal information from Dr. W. B. Turrill), and to a certain extent with the above-mentioned climatetypes of

Bromus inermis. In *Plantago* every population seems to be highly polymorphic, whereas the dune form of *Hieracium umbellatum* is presumably monomorphic.

Large-scale geographical subspeciation does seem to occur in plants (e.g. in *Plantago maritima*: Gregor, loc. cit), but is almost certainly less frequent and less obvious than in animals.

True clines with a genetic basis occur in plants as well as animals (Gregor, loc. cit.), but presumably the staircase type of cline so frequent in animals, between the means for subspecific characters, will be rare and poorly marked in plants. Purely modificational clines are undoubtedly much commoner in plants.

Thus, if I am correct, the fundamental intra-specific tendencies in plants and animals are towards polymorphic and monomorphic interbreeding populations respectively; but this can only be confirmed by exhaustive study, especially in plants.

Another line of research which should lead to valuable results is the study of groups of animals possessing characters similar to those of higher plants. Thus sponges, corals, hydroids, polyzoa, and compound ascidians are all sedentary, and all show large-scale vegetative budding to produce plant-like forms, while some, like the sponges and corals, are also exceedingly plastic and modifiable by environmental conditions. It will be very interesting to see whether intra-specific differentiation in them tends to resemble that of higher plants rather than that of higher animals.

Some sea-anemones show vegetative reproduction by fission. It is, perhaps, no coincidence that many of these are exceedingly polymorphic (e.g. *Metridium senile*: Fox and Pantin, in Phil. Trans. Roy. Soc. Lond. B, CCXXX, p. 415; 1941), the different colour-forms being probably also differentiated in functional ways.

Other marine organisms, though not plant-like in method of growth, resemble higher plants in showing random fertilization and random mass-dispersal (e.g. many echinoderms). Frequently, however, close relatives of mass-dispersed forms show direct development with few offspring and without mass-dispersal. Such closely-related but biologically distinct forms should be compared to see whether their intra-specific differentiation differs in a regular way. Interesting results might also be expected from similar comparisons between anemophilous and entomophilous plants which are otherwise similar, between plants with high and low powers of seed-dispersal, etc.

One difference to be expected is that of greater differentiation between related species wherever distinctive conspicuousness is biologically more desirable than where it is not. This will be so in the flowers of entomophilous (but not of anemophilous) angiosperms, and in certain groups of higher animals, notably birds, in which distinctive colour or song plays an important part in securing a mate (J. S. Huxley, 'The Present Standing of the Theory of Sexual Selection', in 'Evolution', ed. G. R. de Beer, Oxford: 1938). The tendency will be still further exaggerated where closely-related species occur in the same area, as here distinctiveness will help to reduce the biological waste due to hybridization. Obvious examples are the strikingly different songs of the chiffchaff and willow-warbler (*Phylloscopus collybita* and *P. trochilus*) and the general coloration of males and specular colours of both sexes in ducks.

In animals size-differentiation (in relation to size of prey) often occurs among related species, e.g. *Sorex*, *Mustela*, *Felis*, various bats, *Falco*, *Numenius*, *Dryobates*. It would be interesting to see whether anything similar occurs in carnivorous plants such as *Utricularia*, *Nepenthes*, *Sarracenia*, *Dionaea*, etc.

Mr. E. B. FORD discussed the frequency of polyploidy in plants and contrasted this with its rarity in animals. He also pointed out that a phenomenon which has repeatedly confused plant systematics, that of reticulate evolution, occurs in one animal only, the human species, and in a modified form, and he drew attention to the existence of polyphasic conditions in animals which are hardly paralleled in plants.

Dr. K. MATHER. Certain differences in modes of speciation and race differentiation can be attributed to the system of mating operating in the group concerned. Thus the rarity of differentiation by polyploidy in animals is, as Dr. Darlington has pointed out, a result of unisexuality. Other and less obvious consequences also follow from the differences in breeding systems, even where these systems are initially merely different adaptations securing the same result.

Outbreeding is commonly advantageous to both animal and plant species, in that it allows a high average hybridity, and hence effective recombination of gene differences, to be maintained. In animals outbreeding is most often secured by separation of the sexes, though occasionally other mechanisms are encountered. In plants sex separation is relatively rare, presumably because in a stationary organism it leads to a large wastage of reproductive effort. Other and more efficient mechanisms, such as incompatibility and heterostyly, take the place of unisexuality in encouraging outbreeding (Mather, in 'Nature', CXLV, pp. 484-6; 1940).

The advantage of outbreeding may not, however, be permanent. Indeed, there is evidence that in many species rigorous inbreeding has succeeded outbreeding. It is at this stage that the organisms having different breeding systems diverge in their mode of differentiation. Incompatibility and heterostyly are easily modified to meet the new conditions. The incompatible and heterostyle plants are hermaphrodite, and so mutation of the operative gene or selection of the modifier genes affecting pollen growth will secure the adaptation to inbreeding. But, as we know, sex separation involves such complex genetical and developmental mechanisms that simple reversion is not possible. The necessary measure of inbreeding is achieved in another way.

The efficiency of unisexuality as an outbreeding mechanism in a mobile organism depends on the power of one sex to find and mate with an individual of the other type, i.e. on mating discrimination. It is but an easy step to extend this discrimination to the point where an individual will seek out or accept particular members of the other sex. The degree of inbreeding can then be regulated by the choice of mating partners.

There is no doubt of the existence of this state of affairs in the genus *Drosophila*. Not only have flies been shown in experiment to display mating preferences between species and races, but males of a given strain will show preferences unlike those of another strain of the same race

{Dobzhansky and Koller, in Biol. Zentralbl. LVIII, pp. 589-607 ; 1938). Furthermore, Dobzhansky (in Proc. Seventh Int. Congr. Genetics, pp. 104-8 ; 1939) has presented evidence that the size of the effective mating population in the wild is very small in *D. pseudo-obscura*. Clearly the flies mate with fairly closely related individuals, and so a certain measure of inbreeding is exercised. The size of the effective breeding population is a measure of the rate of outbreeding which occurs.

Discrimination may also be exercised indirectly through the practice of mating with any individual from a restricted colony or range of territory, rather than directly by the refusal of particular potential mates.

In this way isolation, differentiation and speciation are occurring in a particular way determined by the outbreeding mechanism which the organism has adopted. No doubt incompatibility, heterostyly, etc., also give rise to peculiar modes of isolation : though apart from the absence of mating preference (which renders the consequences of these mechanisms distinct from that of unisexuality) no detailed conclusions can yet be reached. A study of breeding systems will do much to elucidate the differences in mode of isolation and speciation between groups both closely and distantly related.

Mr. J. R. NORMAN expressed the opinion that the majority of the differences in the systematics of plants and animals, and especially in the methods used by workers in the two groups, were concerned with what might be called microsystematics (infraspecific groupings, etc.). When we came to consider macrosystematics, which formed the principal task of the museum worker, it appeared that these differences were neither as numerous nor as important as had been supposed. He believed that on the whole botanical taxonomy had made further progress than zoological, and that the major systematics had perhaps been cleared up in a greater number of plant than of animal groups, thus enabling workers to concentrate upon the minor categories.

He discussed the taxonomic value of the morphological characters associated with the secondary sexual organs in plants and animals, and suggested that in the flowering plants it seemed to be these characters which so often showed that high degree of plasticity which made the definition of species, genera, etc., so difficult. In some animals, on the other hand, where the systematist had found other morphological characters unreliable, it was the secondary sexual characters which provided a surprising degree of stability (e.g. the genitalia of certain insect groups). Another group of morphological characters which was of considerable importance in zoological taxonomy was that connected with nutrition (e.g. mouth-parts, feeding mechanisms, teeth, etc.), but this played no part in botanical taxonomy.

Mr. W. L. C. LAWRENCE. Two kinds of genetic barriers between species can be distinguished by experiment in *Streptocarpus*. First, there is a property of differential pollen-tube growth. When pollen of another variety or of a closely related species is mixed with a plant's own pollen and placed on the stigma, the foreign pollen has the advantage, as shown by the high proportion of crosses relative to selfs in the progeny.

But where pollen from more and more distant species is used, the advantage becomes more and more displaced in favour of the plant's own pollen until at last only selfed progeny are obtained. There is thus an *optimum discrimination* between pollens, favouring slight hybridity against both extreme hybridity and extreme heterozygosity. This method would seem to combine the greatest advantage of adaptability and fertility.

Secondly, there is a cytoplasmic barrier between groups of species. These differ in such a way that the first crosses between them when carrying the cytoplasm of one group (i.e. being derived from that group as a mother) are male sterile. They can therefore reproduce only by back-crossing. And as has been found in many other plants, the property is hereditary cytoplasmically, so that, in so far as the cross reproduces by back-crossing with the male parent, a new gynodioecious system is created. It is now known that such systems must always depend on a cytoplasmic difference of this kind (Lewis, in *Biol. Rev. Camb. Phil. Soc.* xvii, p. 46; 1942).

It seems likely, therefore, that these same genetic mechanisms which are very generally the means of keeping species apart, become, when they fail to do so, the means of making new species.

Mr. A. J. WILMOTT did not agree with Dr. Richards' statement that the argument that interbreeding indicated conspecificity was now little used: he had heard it recently in that same room. He agreed that hybrids between animals were not common as they were in plants, but insisted that it should never be stated that because two forms interbred they were not distinct species: on the contrary, it should always be investigated whether on other grounds they were one variable species or two species hybridizing. He doubted whether there was any fundamental difference between 'external' and 'internal' differentiae, and agreed with those older naturalists who held that species differed throughout the organism, i.e. that the specific type in the Platonian sense, had been changed. The *Drosophilas* mentioned by Dr. Darlington, once they had been distinguished on cytological grounds, were found to possess morphological differentiae. He strongly disagreed with Dr. Huxley's suggestion that subspecies appeared to be less abundant in plants than in animals, and thought that reference to any of the larger detailed floras of well-worked areas—such as Rouy and Foucaud's 'Flores de France' and Hegi's 'Illustrierte Flora v. Mitteleuropa'—would settle this point. In Britain, to take the Ranunculaceae alone, there were many subspecies of *Thalictrum minus*, *Ranunculus aquatilis* and *R. acer*, quite apart from 'ecotypes' and 'phases'. But in plants such units were commonly treated as small species rather than as subspecies, and their existence was thus obscured. A reason for this might be seen if the *Hieracia* were considered, for if such apomictic microspecies were treated as subspecies, the problem of grouping them into species arose, and this proved to be extremely difficult and unsatisfactory in many instances. Indeed, such grouping is, taxonomically, of the nature of making genera rather than of distinguishing species. Examples of what Dr. Huxley termed 'phases'—not a good term, as a phase might

be expected to be a stage of one and the same form—certainly occurred among plants. He had instanced those of *Anagallis arvensis* and *Trifolium fragiferum* in a previous discussion: the former having scarlet (rarely blue) flowers in Britain and usually blue (more rarely scarlet) flowers in the Balkan Peninsula, the latter having glabrous stems in western Europe and pilose stems in south-eastern Europe.

In closing the discussion, Mr. RAMSBOTTOM said that it seemed that the only conclusion that could be drawn was the obvious one that all systematists were striving after the same ends, though the methods of approach were different. The discussion failed in its main object because it had dealt with the more highly advanced groups of plants and animals, where, assuming evolution to be a fact, there was most divergence, and, moreover, too wide a field had been attempted. It would seem more profitable to discuss problems, say sexual and asexual reproductions, alternations of generations, cytology, parasitism and so on, as they manifested themselves in plant and animal. We had to recognize that the intricacies of nuclear division were amazingly similar in higher organisms when one assumed the relationship was of the remotest, that the pattern on a human finger was sufficient to identify an individual and that a fungal parasite was sometimes a better systematist than was a trained botanist.

OBITUARIES.

EDWIN ASHBY was born at Capel, Surrey, on 2 November 1861. He came of an old-established Quaker family and, like many others of that faith, was an earnest and painstaking student of nature, in which he was encouraged by his father, James Ashby of Red Hill, and his mother, Eliza, *née* Sterry, who was a good field botanist. He started work in his father's tea business in London, but an ocean voyage was recommended for the sake of his health. Accordingly in 1884 he sailed for Australia and was employed in his cousin's estate agency in Adelaide. A few years later he went to Blackwood, in South Australia, where he spent most of the rest of his life; here he had a large estate devoted to fruit-farming and the cultivation of native Australian plants. He was interested in botany, birds and Lepidoptera; but his principal scientific work was the study of chitons. He projected a monograph of the Australian Polyplacophora, and had covered much of the preliminary ground in papers describing new species and reviewing various groups. When he revisited England in 1922, he worked through the types and other specimens of Australian chitons in the British Museum, and also took the opportunity of visiting Paris to see the types of Blainville, Lamarck, etc., in the Natural History Museum there: the results were published in the 'Transactions of the Royal Society of South Australia'. It was, no doubt, a disappointment to him when Iredale and Hull published their 'Monograph of Australian Loricates' (1924-7) before his own work was ready: he loyally gave them what assistance he could, and characteristically offered them hospitality at Blackwood, where they

could discuss the various points on which they disagreed with him. The meeting never came off, but a manuscript giving the detail of the various points at issue has been deposited with the Linnean Society of London, of which Ashby was elected a Fellow in 1919. Ashby presented the types of his new species and a large part of his collection to the South Australian Museum, but much valuable material was lost when his house at Blackwood was destroyed by a bush fire in March 1934. He also published two important papers and some further notes on the chitons of South Africa. He did some important work on the fossil chitons of Australia, which led him to work out a phylogeny of the group (1927, 1929): he was still working on these almost to the end.

He married Esther Maria Coleman in 1890: a son and a daughter survive him. He died at home on 8 February 1941.

R. WINCKWORTH.

RUDOLF BEER was born on 29 November 1873, the son of Bernard Beer and his wife, formerly Marie Louise Astley-Hills, of Bickley, Kent.

He was educated at Dulwich College and also, by reason of health, by private tutors at home, and then at University College, London. He studied medicine for several years at St. Thomas's Hospital, where he came in contact with Professor T. G. Hill. His real bent was always botanical, and instead of a medical career he took a B.Sc. degree by research from University College in 1903. He had published botanical papers before then. His interest was in cytological questions, and some of his finest work was given to the development of spores. Two early papers (1895 and 1899) in 'Natural Science' showed his bent, the first on the nucleolus, the second on multinuclear cells, a subject that he recurred to later. He published most of his work in the 'Annals of Botany', usually by himself, but in conjunction in 1915 with Dr. Agnes Arber.

His cytological work was well adapted to his change over to work on plant diseases during the war. His love of plants was not confined to microscopic work—he loved them in their habit as they grew, and was an expert gardener. He won many medals and prizes, showing at the Royal Horticultural Shows and other shows in the provinces. He was specially noted for tender and greenhouse plants.

During the last war he was a valued member of the staff of the Ministry of Agriculture's Plant Pathological Laboratory, then stationed in Kew Gardens. It was housed in two old Georgian cottages thrown into one—formerly the residences of members of King George II's court. There were traces of those elegant days in the mouldings, and in Mr. Beer's room there was a lady in a medallion on the wall. It was a singularly happy laboratory under the Director, Mr. Fryer, and the botanical side under Mr. A. D. Cotton, now Keeper of the Royal Herbarium, Kew, and is treasured in the memory of all who worked there.

Mr. Beer worked at the diseases of crop plants, and the energies of the laboratory were directed to increasing the food production of the country by combatting the diseases and pests, diagnosing, investigating and naming the new diseases as a step to finding a cure, and giving advice on old and new.

To us who worked with him the recollection of Mr. Beer is that of a man of great kindness, gentleness, and invariable helpfulness. His own ability and learning was only equalled by his modesty, and more, a 'most a shrinking from all publicity or praise. His opinion of his own powers was far too low, but he rated that of his friends and co-workers at a very high level. A pleasing feeling of being really a great (if hitherto unrecognized) scientist was the result of a chat with Mr. Beer.

Bad health dogged him throughout and prevented him from taking the place in the general scientific world that otherwise might have been his, but the happiness of his later years was well known to his friends. The care and devotion of his wife throughout the last years of illness gave him that happiness and comfort to the end, and he died in his sleep last autumn, 23 September, 1940, at Crowborough, in Sussex.

N. L. ALCOCK.

IN the death of THOMAS BATES BLOW at Welwyn on 16 January 1941, at the age of 87, there passed away both a picturesque figure and in many ways a remarkable man. For a fuller story of his life there is an admirable account in the 'Hertfordshire Express' of 25 January, to which I am indebted.

Though I had heard of him, through Groves, some years back, it was only on my retirement from India in 1933 that I got to know Blow well. On my first visit to his home, The Chalet, which he, 'coming of a humble but sturdy stock of builders and carpenters' largely built himself, my original impression of him was 'energetic, independent, thorough, versatile, amiable and great capacity for enjoying life with the spirit of an explorer'.

I was struck by his telling me that at the age of twenty he had made up his mind that as soon as ever he had made enough money he would retire and then be free to do what he fancied, and that is exactly what he did.

His two main interests were photography and bees, and in his determined way he became an expert at both. It was of the bees that he made a commercial success by starting a factory for apiary appliances, and as soon as ever he had put by enough he sold the business.

Travelling abroad was one of his great delights—always with a definite purpose—and he succeeded in visiting a large portion of the globe, including Japan, of which he was a keen admirer. He spent several years in that country and married a Japanese lady. On her death, twelve years ago, Blow set forth via Siberia to see to her affairs. He had a wonderful collection of Japanese prints and works of art.

Though close on sixty, he took an active part in the last war by driving an ambulance for a French Red Cross hospital near Rouen, and received the distinction of becoming a Chevalier of the Legion of Honour.

Blow was a great talker and appreciated the company of a good listener. He had a vast circle of friends, and even when advanced in years he managed to keep in touch with many of those that remained. Though having, may be, totally different interests, his friends were your friends: they all shared an affection for Blow.

As a naturalist he was an ardent field botanist from his youth up, his outstanding interests being ferns and charophytes. Wearing his old Norfolk jacket, he loved taking his friends round his garden and recounting the history of his large collection of ferns, both beautiful and curious. He was fond of attending scientific meetings and taking part in discussions: he became a Fellow of the Linnean Society in 1884, and his skull-cap will be familiar to many in the Society.

It was the charophytes that constituted my tie with Blow. He might be said to belong to a well-known charophyte quartette, consisting of the Groves brothers (Henry and James) and Canon Bullock-Webster. Blow was a very old and close friend of the Groves brothers, their acquaintance dating from 1874. These two did the systematic work, whilst Bullock-Webster came in later as the skilled microscopist and student in particular of the decoration of the oospore membrane, so valuable a guide in the diagnosis of species. Blow's rôle was that of a collector. Wherever he went on his world travels from 1895 he lost no opportunity of bringing back specimens. Of these tours I have given a short sketch in the 'Journal of Botany' for October 1938. They included the West Indies, Ceylon, Australia, Japan, Madagascar and various Mediterranean countries.

His collecting was not of the ordinary kind. As in all that he undertook he was thorough, he took care to float out all his specimens properly, and later on started to retain also in fluid a small portion of each gathering bearing ripe fruit, on which James Groves laid such stress, as alone admitting of satisfactory examination under the microscope. Curiously enough, Blow was content to collect only: though acquiring a fine grasp of their appearance in the living state he was not interested in the detail of their structure. His gatherings were the subject of several papers by Groves, the most important probably being that on the Madagascar plants, one of which, *Nitella Blowiana*, was named after him.

A man of amazing energy, he was a great believer in early rising and hard work. When he reached eighty he issued a special card to his friends playfully boasting of still being able to do most of the things they could do and having the memory of the past as well. I remember his remarking with admiration on the unique feat of G. C. Druce, one of his oldest friends, in producing so many Floras. A very attractive man: many will remember for long that amiable twinkle of his.

G. O. ALLEN.

JAMES GORDON DALGLIESH was born in India in 1878 and died on 21 October 1940. Throughout his life he was interested in natural history; his taste was catholic—birds, mammals, seashore life, snails, wild flowers, insects, brachiopods are among the subjects he took up. At one time he worked on a tea estate in the Darjiling district; it was at this period that he wrote an excellent popular book on the birds of India. After his retirement from India he lived for many years in Hove, and during the four years' war took up work in the Brighton Municipal Museum, where he continued for many years. His later years were spent at Horsham. He was elected F.L.S. in 1927. R. WINCKWORTH.

Dr. JOSEPH BURTT DAVY (1870-1940) was born at Findern, Derbyshire, on 7 March 1870 and died at Birmingham on 20 August 1940. Like so many eminent botanists of this country, he was a member of the Society of Friends, both his parents being of well-known Quaker families of long standing. Burtt Davy was educated at a private school at Ilkley and then went to Kew and studied systematic, economic and geographical botany. In 1891 he was appointed as an assistant in the Director's office but resigned the following year because of ill-health. He migrated to the U.S.A., when he obtained a student assistantship in the Department of Botany, University of California, and also studied agriculture. In 1896 he was appointed Lecturer in Botany and Assistant Botanist, California State Agricultural Experimental Station, and in 1901 Instructor in Botany in the University. The following year he became Assistant Curator (Botany) in the United States Department of Agriculture.

After the Boer War, Lord Milner, with his 'young men', in his aim to bring prosperity as well as peace to South Africa, set on foot many reforms, one of which was the establishment of a Department of Agriculture in the Transvaal. Burtt Davy in 1903 accepted the invitation to become Government Agrostologist and Botanist and Chief of the Division of Botany. At Pretoria he began the formation of the present National Herbarium, collecting 15,000 numbers himself and inspiring others to join in the work. He resigned his post in 1913 and became Consulting Botanist to the Agricultural Supply Association, Ltd., Johannesburg, and also started farming on his own account at Vereeniging, where he had 400 acres devoted to pedigree stocks of maize. He made a success of this and retired to England in 1920; in 1924 he obtained the degree of Ph.D. at Cambridge. He went again to America, and while collecting material for a flora of the Redwood belt in 1925 had an accident which necessitated a return home for special treatment, and on his recovery he joined the staff of the Imperial Forestry Institute at Oxford as University Demonstrator in Forestry and Lecturer in Tropical Forest Botany, a position which he held until just before his death. He was made Hon. M.A. at Oxford in 1926 and D.Phil. in 1936.

Such in outline is the career of Burtt Davy. It is given to few botanists to have so wide an experience—experience, moreover, from which he benefited greatly because of his many interests.

His first papers (1891-2) were on additions to the flora of the Alford District of North Lincolnshire. On arrival in California he at once began a long series of notes on systematic and economic botany, published for the most part in 'Erythea.' He had, however, always an interest in the broader aspects of ecology. Thus in 1902 he published accounts of the stock-ranges of north-western California, the native vegetation and crops of the Colorado Delta, and the alkali-indicators of the Glen Country Gooselands.

On reaching South Africa he continued the series of notes, now principally in the 'Transvaal Agricultural Journal', having two papers in its first volume. He devoted a good deal of attention to the introduction of plants likely to prove useful in the Transvaal, especially maize, now the staple crop of the country, the best varieties of American Uplands

Cotton, and Teff Grass, of which there are at present about a quarter of a million acres under crop in the Union. In 1913 was published his 'Maize, its History, Cultivation and Uses', with special reference to South Africa, a volume of 831 pages, and long out of print. He travelled far and wide, and in 1917 published a plan for a Botanical Survey of the Union.

Perhaps the work by which his name will be principally known is his 'A Manual of the Flowering Plants and Ferns of the Transvaal with Swaziland, South Africa'; the two parts of the first volume were published in 1926 and 1932, and the second volume, on which he was engaged until a week before his death, is to appear shortly.

In this country he was interested chiefly in *Salix* and *Ulmus*, but his chief love was Africa. At Oxford he inspired many of the men who attended his lectures with a keen appreciation of the value of systematic botany, and was able to build up a valuable herbarium, chiefly of ligneous plants. During this period he continued to write systematic and ecological papers on Africa, where he extended his observations. He also began two useful series of handbooks written in collaboration with his colleagues and students—'Forest Trees and Timbers of the British Empire' (3 parts) and 'Check Lists of the Trees and Shrubs of the British Empire: (1) Uganda, (2) Nyassaland, (3) Gold Coast'.

Burt Davy was an enthusiast on any subject he took up and a most painstaking worker. I have never met anyone who was so distressed at the possibility of having made a mistake, nor so anxious to correct it. He was somewhat heavy in his mode of delivery, and, when giving a paper, too prone to enter into detail. But he inspired his students at Oxford, and was for them both a master and a friend.

My own relations with Burt Davy were always extremely friendly. He took a great interest in the botanical expeditions to Africa undertaken by members of the Department of Botany and was ever ready not only to give fully of his experience but to share his treasures.

The late Professor C. E. Moss, who was not given to withhold criticism, told me that he regarded Burt Davy's services to South African botany as invaluable.

Of the man himself, the tribute paid by Sir Michael Sadler in 'The Times' may be quoted. 'Dr. Burt Davy was typically a Quaker man of science—gentle, indefatigable, exact and humane. He was a lover and physician of trees. To be with him in woodland was to be reminded of the woods in the A.V., "the tree of the field is man's life"'. His steep garden on the slope of Shotover is full of beauty and reminiscence. For many years he gave advice on tree-planting to the Oxford Preservation Trust. He had the gift of friendship and of faith.'

At his death he bequeathed most of his valuable library to the Department of Botany of the University of Oxford: he also willed 'to the Chancellor, Masters and Scholars for the time being of the University of Oxford' a large sum of money 'to be invested for the purpose of founding a scholarship . . . for research work in Taxonomic Botany and/or Tropical Plant Ecology . . . at the Herbaria of the Department of Botany and of the Imperial Forestry Institute'.

He married Miss Agnes Bolton of Berkeley, California, in 1897, who

survives him. It was owing to her care and devotion that Burt Davy was able to carry on so tirelessly, and we extend to her our sympathy and gratitude.

J. RAMSBOTTOM.

FRANCIS DRUCE, who died by enemy action on 16 April 1941, aged 68, was one to whom this Society owes much, not only for his nine years, from 1931 to 1940, of service as honorary treasurer, during which he proved himself a wise administrator and counsellor, and for the work he did on the Society's various committees, but also for his many acts of personal generosity. These included his action in paying out of his own pocket the greater part of the expenses of the 150th anniversary celebrations in 1938. Though he resigned the treasurership in the autumn of 1940, his spare, rather short figure will be greatly missed at the Society's meetings by Fellows and Associates.

Born on 3 January 1873 at Clapham, Francis Druce was the fifth son of the late Alexander Devas Druce, and Kate, his wife. After a short period at Charterhouse, which he left for reasons of health, he went to Harrow, and later to Magdalen College, Oxford, where he took his degree in 1894. He then entered the old-established solicitors' firm of Druces and Attlee, in which he became a partner. Never a robust man, he had a long illness in his middle thirties, and though he recovered completely, he retired from business comparatively early in life, soon after the last war. Thereafter he was able to devote himself to his scientific interests, particularly meteorology and botany, and to Church work, for he was a devout churchman, giving much time to the affairs (and especially the boys' club) of the Chelsea parish, S. Simon Zelotes, of which he was a churchwarden. His business training, public spirit and methodical character clearly singled him out for office in societies to which he belonged, and he was honorary treasurer of the Royal Meteorological Society from 1913 to 1918 and again from 1925 to 1932. He never lost his interest in meteorology, and his knowledge of weather conditions and probabilities made him a most valuable companion upon country expeditions; but botany, particularly the British flowering plants, eventually became his chief scientific study. He also had a good knowledge of British birds, with an excellent ear for bird song.

As a botanist Druce never specialized in any one group of plants, but he had a wide general knowledge. He organized a great number of tours in various parts of the British Isles, including many of the most remote areas, in search of plants, and upon these expeditions he was very frequently accompanied by Mr. A. J. Wilmott, of the Natural History Museum, with the result that the national collections received much valuable additional material. The tours of Druce and his friends resulted in finding many new localities for rare species, and in confirming many old ones, and there were very few British plants which he had not seen growing wild. He was, however, not a mere rarity hunter, but a real lover of natural history who was out week after week, throughout the year, observing the plants and birds he met with, and anyone who has been his companion on these occasions can testify to his energy and endless patience. He also, though less regularly, collected plants in various parts of the Continent.

In addition, Druce was a book collector of assiduity, intelligence and originality. His first love was for meteorological books, his collection of which he gave, about seven years ago, to the Royal Meteorological Society. In 1913 he began to collect botanical books, and eventually formed an exceptionally interesting and individual library, relating principally to the British flora. It was the subject of an article in "The Times Literary Supplement" on 31 December 1938, and contained copies of most of the great books in English botanical history from the fifteenth century onwards, including, notably, a magnificent copy of 'The Grete Herball' of 1526, a superb set of Curtis's 'Flora Londinensis' and many other fine things. But these, perhaps, another collector of means might have acquired. What gave Druce's library its character was the trouble he took with the lesser books, such as the popular botanical works of the last century. For these he searched with his usual thoroughness, carrying always in his pocket a notebook with a list of the editions he already possessed, and never missed an opportunity of visiting a book-shop, however humble. In this way he was able to bring together complete sets of the editions of many books—Johns's 'Flowers of the Field' was an example—and to create a library which threw much light upon the history of botany as a popular study in this country. Unhappily, the catastrophe which cost him his life, and deprived those who knew him of a trusted and valued friend, involved also the destruction of the whole of his herbarium and the great majority of his books. Some twenty of the choicest volumes he had sent to safe keeping on the outbreak of war, but most of the remainder were either destroyed or seriously damaged. In his will Druce left a first choice from his library to the Linnean Society, and some things of great interest and value have come to the Society by that bequest; but the library—so characteristic of a most admirable and lovable man—which Druce planned and brought into existence, no longer exists.

Members of Druce's family have, since the 18th century, been Clerks to the Innholders Company, a post which he himself held, and which is now held by a nephew. It was an obvious joy to Francis Druce when, in the autumn of 1940, he became Master of that ancient City Company, an honour which his great-great grandfather, Thomas Druce, had also received. He was unmarried. He wrote very little, but a paper, compiled in conjunction with Mr. N. Y. Sandwith, containing the results of one of his last investigations, appeared posthumously in the 'Journal of Botany' for May 1941. It dealt with a curious alien crucifer found growing on top of a dug-out shelter in Chelsea. A new British marsh orchid was named *Orchis Francis-Drucei* in his honour by Mr. A. J. Wilmott in 1936.

I. A. WILLIAMS.

The death of EUSTACE ROLFE GUNTHER, who was accidentally shot while on active service on 31 May 1940, has robbed the *Discovery* staff of a most loyal and devoted colleague. The loss which the science of oceanography has sustained will be deeply felt when the minds of men turn again to the conquests of peace.

E. R. Gunther was born in 1902 and was a son of the late Dr. R. T. Gunther. He was educated at the Dragon School, Oxford, at Winchester

and at Caius College, Cambridge. He was elected Fellow of the Linnean Society in 1929.

He joined the staff of the *Discovery* Committee in 1924 and was one of the original band of scientists appointed under the leadership of Dr. Stanley Kemp, to study the biology and physical environment of the great whales in the Falkland Sector of the Antarctic. He took part in the initial voyage of the investigations in Scott's old *Discovery* in 1925-7. All who sailed with him on this and on later voyages speak of Gunther's single hearted devotion to duty, his indifference to fatigue or personal discomfort and of his conscientious attention to accuracy and detail. In 1931 he led a successful expedition in the Committee's smaller ship, the *William Scoresby*, up the coasts of Chile and Peru to investigate the so-called Humboldt Current. In the same ship in 1927 and in 1931-2 he made a trawling survey of the waters of the Patagonian Continental Shelf, and in 1936-7 he spent a season around South Georgia marking whales from a whale catcher, an arduous and exacting task. During these marking trips he made some acute observations on the movements of whales in the water which are the subject of a paper to be published in due course. He published, in collaboration with Professor A. C. Hardy, a detailed paper on the ecology of the Antarctic plankton based upon surveys made by the *Discovery* and *William Scoresby* mainly around South Georgia. Later he produced a comprehensive report on the results of his work on the Humboldt Current. He also published in collaboration a paper on the fatty and vitamin content of the plankton, work which was carried out at Cambridge during leave between two expeditions to the south. Much of his time at the Natural History Museum in the twilight of the peace before the war was taken up with the assembly of the data from his trawling surveys, which it is hoped to publish, and with the preparation of his paper on the movements of whales. He was troubled by the shadow which oppressed us all during those years, and in 1937 he joined the Territorials as a personal reaction to the gathering gloom. At the time of his death he was a Second Lieutenant in the Royal Artillery.

Gunther was a man of amazing industry and power of concentration. He had a passion for accuracy and a love of detail which gave permanence to his work. The laborious and time-consuming task of collecting and assembling the data from an intensive plankton survey, such as that needful for the composition of the report on the South Georgia plankton, could only have been carried through to a successful conclusion by a man of Gunther's temperament. Because of this he was a slow worker and he was well aware of it, and would often speak of it with a smile and with that modesty which was one of his finest qualities. But he believed, and many will agree with him, that in the search for truth time is of no importance. His patience and his eagerness in that search will remain as examples to those who hope to be able to carry on his work.

With Gunther's interest in every branch of biology went an intense curiosity about the world around him. He had an enquiring mind and a zest for life which made him a full man and his company stimulating. The love of his work in the *Discovery* was one of the main influences in his life, and from it sprang his loyalty and devotion to his colleagues,

his deep interest in everything that concerned them and the welfare of the staff as a body. He often made his home the centre of delightful informal gatherings which those who attended them will always remember. For it was in his own home, as the centre of his happy family, that Gunther was at his best. No picture of him would be complete that did not show him at the head of his hospitable table, at his fireside, under his own vine and fig tree. It is thus that those of us will like to remember him best who saw him at home and who, with him and his wife, have 'tired the sun with talking and sent him down the sky'.

In 1929 he married Dr. Mavis Carr, and he leaves a son and two daughters.

F. D. OMMANNEY.

HENRY BAKER LACEY was born at Leicester on 22 April 1871 and educated at the Wyggeston Grammar School in that town; for a time he was biology master in his old school. Some lectures given by T. H. Huxley led Lacey to the Royal College of Science, where he won the Forbes Medal. He became Demonstrator in Biology in St. Mary's Hospital Medical School, and, while holding that post, he joined the staff of Chelsea Polytechnic in 1896 as a part-time teacher of biology. His work at Chelsea grew rapidly, and he was appointed full-time head of the Department of Biology in 1902, and was recognized by the University of London in 1903. He was elected Fellow of the Linnean Society in 1920. Lacey retired from teaching in December 1933: and, after a period of travel in Europe and North Africa, he settled at Worthing, where he seems to have gardened as energetically as he had formerly taught. The end came suddenly in the early morning of 10 March 1941: he died in his sleep.

During his working life, Lacey devoted all his time and energy to his teaching and to the organization of his department, and he never found time for research. So close was the union of the man and his work that it is hardly possible to speak of Lacey apart from his department. He was fond of saying that he started the teaching of biology at Chelsea in one attic, with one student and one dog-fish. He left the department the largest of its kind in the country, with more than eight hundred students, a number of well-equipped laboratories, and with a record of more than thirty years of successful work. That is his contribution to biological science in this country.

B. BARNES.

HERBRAND ARTHUR RUSSELL (1858-1940), *11th Duke of Bedford*. The family of Russell, one of the greatest in the British aristocracy, has been pre-eminent for two centuries and a half as a pioneer in the improvement of the country round their large landed estates and in the study of the natural conditions which prevail on them. None of the senior branch of the family, that is to say none of the Dukes of Bedford, has taken a leading part in the political leadership of the nation, but almost all of them have concentrated attention on all sorts of agricultural and rural improvement, and on the study of rural interests, including the

application of zoology and botany to the bettering of farm animals, crops, grasses, and trees, as part of the enlightened management of a large agricultural estate.

To this heritage the subject of this memoir succeeded in 1893. He had not expected to be the Duke of Bedford, and had taken up a military career, as has been the custom of the younger sons of the English nobility for many generations. After a period of residence at Balliol College, Oxford, he had served in the Egyptian campaign of 1882-3, and had for several years been military A.D.C. to Lord Dufferin when the latter was Viceroy of India between 1884 and 1888. On his return to England, he took an active part in the discussion of military matters, but the whole cast of his life was altered by his unexpected succession to the dukedom of Bedford on the death of his brother in 1893.

From this time he gave himself to what he conceived to be the duties of a large landowner, and devoted himself single-mindedly to the running of his estate. In this he followed the tradition of the family, which has been described by Froude as "great in the administration of their enormous property, great in the millions they have spent on their tenants' cottages, great in the remission of rents in the years when the seasons were unpropitious". To live on his estate was to feel under the wing of a paternal authority. His interest was everywhere. He saw personally to almost every detail of his vast property, and its condition, during both good agricultural times and when the days of farming were dark, has been an evidence of the careful management which he gave to it.

One of the evidences of this careful management was the preparation and issue of his book, 'A Great Agricultural Estate', in 1896. This book gave the financial and other details of the administration of his landed property, apart from that in London. He showed that, even at that time, he made very little profit out of the very large interest in the land. But he was a father to the people on his property, and nothing that occurred or was carried on in the regions where his land was situated was outside the pale of his attention.

Apart from the management of his estates, he gave his attention to a large number of local forms of government, both in London and in the country, as a duty resulting from his position as a large landowner. He was Chairman of the Bedfordshire County Council for many years, was the first Mayor of Holborn, the London borough where much of his London property was situated, and was, for a time, Lord Lieutenant of the County of Middlesex. In addition, he was a Trustee of the British Museum, was President of University College Hospital and of the Imperial Cancer Research Fund, as well as of the Cremation Society of England.

But apart from his own estate and military matters, his greatest interests were found in natural history and especially, in zoology. He himself described his recreations as 'Zoology and natural history', but he by no means thought of them as mere recreations, and it was to their practical applications that his thoughts chiefly tended. He became a Fellow of the Linnean Society in 1895, and from 1899 to 1935 he was President of the Zoological Society of London.

His work on zoology has been chiefly in connection with the
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acclimatization of animals and in the development of the Zoological Society and its collections. He formed and maintained a large private zoo at Woburn Park. The writer knew this over forty years ago, and his collection was increasing almost up to his death. It is famed, in fact, throughout the world. In getting together specimens of the animals he wished to have, he employed the best collectors and spared no pains or money on their care. In his collection might be found the European bison, which was exterminated in its proper habitat in Lithuania during the war of 1914-18, and he was gradually building up a herd of this interesting animal. Prevalsky's wild horse may also be found there, as well as Père David's deer, and it is, in fact, the only place in the world where these animals can now be seen.

Apart from his own collection of animals, he worked very seriously in developing the collections of the Zoological Society itself. He was behind all the efforts to improve the range of animals shown in its gardens in Regent's Park. The aquarium there was established on his initiative, but his greatest achievement was the foundation of Whipsnade in Bedfordshire, the country zoo where the animals live a free and open life. In this the Duke took great delight, and his patronage made possible there many things which would otherwise have been very difficult to obtain.

The interest of the late Duke of Bedford in agricultural and horticultural experiment was hardly less keen than that in zoology. On succeeding to the dukedom he found in existence the Woburn Experimental Station for the investigation of manurial problems, which had been founded by the ninth Duke (Hastings Russell) in 1876 and placed under the management of the Royal Agricultural Society of England, and, till his death, he allowed this Station to continue on the land originally granted for the purpose. Till 1912 he bore the whole cost and expenses of these experiments, but after that time, on the setting up of the Development Commission, he withdrew his support on a grant becoming available from that body. The Station has been continued, and it now is, with the exception of Rothamsted, the oldest agricultural experimental station in the British Isles. Its results for the first fifty years, recently collected and published by Sir E. J. Russell and the late Dr. J. A. Voelcker, form a lasting tribute to the farsightedness of the founder and his two sons.

But the Duke's connection with another piece of experimental work was much closer. In the early nineties, an old friend of the Duke, Mr. Spencer Pickering, after making small experiments on fruit-growing, became impressed with the unsatisfactory basis of this industry, and the desirability of having an experimental station where practical questions could be worked out 'free from any taint of commercial expediency'. As he had not the funds for such an undertaking, Mr. Pickering laid his plans before the Duke of Bedford. The scheme met with approval, and the Woburn Experimental Fruit Farm was established in June 1894. This Station was conducted jointly by the Duke of Bedford and Mr. Pickering, the latter serving as working director. It concerned itself primarily with cultural and similar problems of fruit culture, and was not equipped for special scientific investigations except

on chemical questions. But it was the first station established for the careful study of the problems of fruit culture in Britain. It was carried on with great devotion for twenty-five years, and the reports, twenty-four in number, published under the joint names of Pickering and the Duke of Bedford, now form classics in fruit study. The greater part deal with such questions as the planting, trenching, manuring, pruning, consecutive fruiting of fruit trees, flowering of apple trees, the soils on which fruit is being grown, the effect of heating soil, and similar matters. The effect of grass sod on trees and the possible cause of this effect came in for quite extended experiment and discussion. The whole results were finally summarized in a book, 'Science and Fruit Growing', issued in 1919 under the joint names of Pickering and the Duke. After the great war of 1914-18, the Duke considered that the economic conditions resulting from the war rendered it impossible to continue the farm as a private venture and, after a number of negotiations, it was finally closed. There is no doubt, however, that it has been the source of inspiration which has led to the establishment of the famous fruit stations at East Malling, in Kent, and at Long Ashton, near Bristol, as well as a number of others.

The Duke's enthusiasm for natural history was shared by his wife, who was a great student of birds and who made very many long voyages at sea in quest of observations on them. For this purpose a fine yacht was maintained, and in the later years a fleet of aeroplanes also. The Duchess was, however, lost during an aeroplane flight in 1937, and then the whole of these amenities were given up. The Duke's son and successor is, however, an enthusiastic naturalist and is a recognized authority on some groups of birds, so that it is probable that the head of the Russell family will still carry on the tradition in the future.

Personally, the late Duke of Bedford was a retiring country gentleman. Living on his estate, one got the idea that the part he took in public life was a duty which he forced upon himself rather than work which he liked. He was honoured in the neighbourhood of his home in Woburn as well as on his other property, and was respected as the *beau idéal* of an English gentleman.

HAROLD H. MANN.

Sir ALBERT CHARLES SEWARD. To know such a man as Professor Seward was a privilege. We had come to regard him as the leading botanist of the country, the man who not only had done splendid work but who, because of continued energy and mature judgment, occupied a central position in the biological work of the country.

His contribution to science was made both in a wide field and in the more specialized direction of fossil plants, on which his researches began over fifty years ago. After his first work on various Palaeozoic plants, he undertook his life work—the description of large fossil floras of Mesozoic age, and it was here that his masterly contributions will remain as his memorial. His first interest in his specimens was in their form, then in their general botanical nature, for which he drew for comparison on his immense knowledge of living plants. He would then apply the information he gained to build up theories on the wider aspects of past

life—past geographical distribution and past climates. Though he did careful anatomical work, finely preserved internal details never interested him as deeply as a really handsome shoot or leaf.

His later contributions were largely as a teacher and popularizer. In all his work it was his constant effort to be simple and easily understood. Although his great four-volume textbook is most used as a work of reference, its manner charms the reader. His 'Plant life through the Ages' was written primarily for those with only general interest in botany and geology; and then the book he finished just before his death was an account of geology written for those who know none of this subject, but it is safe to surmise that its value will not be confined to such readers.

He was also a very remarkable lecturer in public as well as to student audiences, and one felt that his rich and beautiful voice was the reflection of his character. There will be many at future meetings of the British Association who will regret that they will now hear him no more.

Such ability and such sterling worth were quickly recognized, and as opportunity occurred he was offered many duties. His excellent judgment made him the ideal man for councils of learned societies, and he served three times as Vice President of the Linnean Society. The thirty years he was head of the Cambridge Botany School was a period of development and success which will be rightly associated with his name. A more loyal friend of student and staff alike could not be imagined. In addition to this heavy duty he became Master of Downing College and undertook various other University work which culminated in his becoming Vice-Chancellor. It is, indeed, remarkable that a man whose time was so much occupied with varied administrative work should have been able to undertake and finish long research studies.

Recognition of his merit was wide and unstinted, and he received the highest scientific honours. Although a man of natural modesty, it gave him real pleasure to receive the honour that was his due. His was indeed the splendid life of a great man who was thoroughly happy in his lot, and equally successful in his work and in his contact with his fellow men.

TOM M. HARRIS.

By the death of EMMA LOUISA TURNER on 13 August 1940 the Society has lost one of the earliest elected of its women Fellows. Miss Turner was a pioneer in bird photography and a Gold Medallist of the Royal Photographic Society. Much of the work that her skill and patience produced thirty years ago can stand on its own merits even today, in spite of the improvement in modern equipment. She was not only an expert photographer but a most capable and careful observer, and was one of the first honorary women members of the British Ornithologists' Union. Although she travelled much in the study of the bird life of Great Britain, her name is especially associated with the Norfolk Broads, where her houseboat at Hickling will long be remembered by those ornithologists who enjoyed hospitality there, and with Scolt Head, where she undertook the duties of watcher for two seasons. She was also President of the Norfolk and Norwich Naturalists' Society. The best known of her books, 'Broadland Birds', and 'Bird Watching on Scolt Head', were the outcome of her life in Norfolk, and, delightfully

written and full of original observation, have a permanent place in ornithological literature.

E. L. Turner had many interests besides ornithology. She read widely and was a keen gardener. She was particularly interested in field archæology, and for thirty years she sailed her dinghy herself about the Broad's in all weathers. During the last war she worked as cook in a V.A.D. hospital, where, it is said, her treacle puddings were famous for their excellence.

Although not of robust constitution, she possessed vitality and determination which carried her over fatigue and difficulties that might have deterred stronger folk. Up to the last, in spite of failing health and eyesight, she retained most of her zest for living and her sense of humour. Her friendships were many, for she had a rare interest in and tolerance of her fellow men, with a special liking for young people, who never sought in vain for her sympathy or advice. Indeed, her enduring memorial will be in the affectionate recollection of two generations of ornithologists and bird watchers whom she infused and encouraged with her own enthusiasm.

M. D. BRINDLEY.

GEORGE CRESWELL TURNER, J.P., F.L.S., was born in Leicester on 13 August 1858, and throughout his life was associated with that city. He followed a business career in the wholesale boot and shoe trade, becoming, in due course, chairman of W. & E. Turner, Ltd. He was taken ill at work in his office and died very shortly afterwards on 17 October 1940, at the age of 82.

Apart from his business interests, Mr. Turner took a keen and practical interest in church affairs, in civic matters and in education. He was three times President of the Leicester Free Church Council and a past President of the Free Church Federation. He was elected to the Leicester Town Council in 1892 and specialized in educational affairs, becoming Chairman of the College of Art and Technology and a member of the Education Committee. He was a governor of several Leicester schools.

All his life he was a keen observer of nature, being especially interested in Flowering Plants and birds. He was President of the Leicester Literary and Philosophical Society during the years 1915-16, and for the last thirty years of his life acted as Chairman of the Botanical Section of that Society. In this position he stimulated a great interest in botanical work amongst Leicester field naturalists. It was due to his encouragement and very generous financial help that 'The Flora of Leicestershire and Rutland', by A. R. Horwood and the third Earl of Gainsborough, was published in 1933. It is of interest to note that the Introduction of the Flora contains an excellent portrait of Mr. Turner.

He was elected a Fellow of the Linnean Society in 1897.

His love of plants led him to travel extensively to Norway, Switzerland, Palestine and the Mediterranean countries. From all these places he brought back photographs of the vegetation.

He was a keen gardener, and grew many interesting plants at his lovely estate in Charnwood Forest. Until his death he was Chairman of the Gardens Committee of University College, Leicester.

By his death the naturalists of the Leicester district have lost a leader and patron who, until the end of his life, retained with all its freshness his love of the countryside, and who, by his kindly interest, continued to encourage younger men to investigate the local flora.

C. T. INGOLD.

Sir HERBERT WRIGHT, Kt., was born in Lancashire on 10 September 1874 and completed his education at the Royal School of Science in London. In 1900 he went to Ceylon to serve under Dr. J. C. Willis as Scientific Assistant, that is to say, he obtained a Government research fellowship with three years before him in which, untrammelled by other duties, he could establish his reputation as an investigator. It was suggested to him that the seasonal behaviour of the Ceylon Flora needed study, and he gathered the data for a paper entitled 'Foliar Periodicity of the Endemic and Indigenous Trees of Ceylon' (Ann. Roy. Bot. Gard. Peradeniya, II, pp. 415-517; 1905): he studied, also, the ebonies of Ceylon and published a very thorough account of them (*ibid.* II, pp. 1-106; 1904).

He wrote his 'Hevea brasiliensis or Para Rubber' (Colombo, 1905)—a book of 126 pages, destined in later editions to be much enlarged—as a service to the new rubber industry; for he had, meanwhile, passed from the post of Scientific Assistant to the Director to that of Controller of the Peradeniya Experimental Station, which had been established as an offshoot of the famous Garden. In 1907 two friends persuaded him to join them in establishing in London a Rubber Estate Agency and Publishing House, with the 'India Rubber Journal' (which he edited until 1917) as one of its publications.

In 1915 he was nominated by the Royal Commission of the 1851 Exhibition a member of the Governing Body of the Imperial College of Science and Technology, South Kensington, and soon became Chairman of the Executive Committee, Chairman of the Finance Committee and Treasurer. It was for services such as these that he received the honour of knighthood in 1930.

He was Chairman of the Rubber Growers' Association in 1931, and a Director of many companies until his health broke down. He died at the age of 66 on 28 October 1940.

Strenuous in his recreations as well as in his work, in his active days he used to ride to hounds in pink.

The four editions of his 'Hevea brasiliensis' and his later books, 'My Tour in Eastern Rubber Lands' and 'Science of Para Rubber Progress', are records of the way in which the plantation industry grew.

I. H. BURKILL.

BENEFACTIONS

LIST *in accordance with Bye-Laws, Chap. XVII, Sect. 1, of all Donations of the amount or value of Twenty pounds and upwards, received during the past Twenty years.*

1922

- The late Sir Joseph Hooker : Donation of his Medals and Decorations. (Reversion to Linnean Society on Lady Hooker's decease.)
 Anonymous donation in aid of publication of the late Dr. E. A. Newell Arber's paper, entitled 'Critical Studies of Coal-Measure Plant-impressions', £60.
 The Percy Sladen Memorial Fund : Cost of printing and illustrating 'Transactions', 2nd ser., Zoology, vol. xviii, part 1.

1923

- Dr. W. Rushton Parker : (1) Donation of Oxford New English Dictionary : vols. i-x, 1888-1928, and Supplement, 1933, 4to. (2) Encyclopaedia Britannica : ed. XI, Cambridge, 1920-2. 32 vols., 4to.
 E. Heron-Allen, Esq., F.R.S. : Contribution of £25 towards the cost of paper on the Foraminifera of Lord Howe Island.

1924

- The Percy Sladen Memorial Fund : Cost of printing and illustrating 'Transactions', 2nd ser., Zoology, vol. xviii, part 2.

1925

- Mr. Reginald Cory : New Presidential Chair, emblazoned with the Arms of the Society.

1926

- Subscription portrait of Dr. B. D. Jackson, R.N.O.
 Mr. A. D. Michael : A large number of Books and Pamphlets from his Library.
 The late Mr. A. O. Walker : £200 free of Legacy Duty.
 An Anonymous Donor : £100 to establish a Fellowship in memory of the late Prof. E. A. Minchin, F.R.S., Sec.L.S.
 The Royal Society : Donation in aid of publication of Mr. G. P. Farran's paper on Biscayan Plankton.—Part 14. The Copepoda, £60.
 The late Mr. Frank Morey : £100 free of Legacy Duty.
 The late Mr. George Lewis : Books and pamphlets on Entomological subjects.
 Capt. E. G. Spencer-Churchill : A copy of a collotype reproduction of 'The herbal of Apuleius Barbarus . . . (MS. Bodley 130)'.
 The Percy Sladen Memorial Fund : Cost of printing and illustrating 'Transactions', 2nd ser., Zoology, vol. xix, part 1.

1927

- The late Mrs. Mary Anne Stebbing : £100 less Legacy Duty.
 Dr. Francis Pierrepont Barnard : Bequest of Sir James E. Smith's seal, his collection of seal impressions, and some portraits.
 The Percy Sladen Memorial Fund : Cost of printing and illustrating 'Transactions', 2nd ser., Zoology, vol. xix, part 2.

1932

- Mr. Francis Druce : Donation towards the cost of new books, £50.
 The Royal Society : Donation in aid of the publication of papers resulting from Dr. Worthington's Expedition to the East African Lakes, £75.
 Subscription portrait of the late Professor Julius von Sachs, F.M.L.S.
 Cambridge Expedition to the East African Lakes, 1930-1 (Dr. E. B. Worthington, leader).—Unexpended balance of expedition funds, for the publication of the scientific results, £175.
 Carnegie Institution of Washington : Donation of a considerable number of its publications.

1933

- The Royal Society : Donation in aid of the publication of Dr. H. Boschma's paper, 'The Rhizocephala in the collection of the British Museum', £60.
 The Percy Sladen Memorial Fund : Cost of printing and illustrating 'Transactions', 2nd ser., Zoology, vol. xix, part 3.

1934

- Mr. Francis Druce : Certain legal expenses connected with the Society's interest in the Will of the late Mrs. Jane Jackson, £33 14s.
 Mr. Warren R. Dawson, F.R.S.E. : Compilation of 'Catalogue of the Manuscripts in the Library of the Linnean Society of London.—Part 1. The Smith Papers'; and cost of binding the additional series of correspondence, etc.
 The Royal Society : Donation in aid of the publication of Dr. G. S. Carter's paper, 'The fresh waters of the rain-forest areas of British Guiana', and Mr. H. N. Dixon's paper, 'A contribution to the Moss flora of Borneo', £85.
 The Misses Phipps Tiarks : Copy of portrait of N. B. Ward, F.R.S., F.L.S., by an unknown artist; engraving after Knight's portrait; drawing of Ward's conservatory; and his 'Pitt Club' medal.

1939

- The Royal Society : Donation in aid of publications, £200.
 The Percy Sladen Memorial Fund : Cost of printing and illustrating 'Transactions', 3rd ser., vol. i, part 1.

1940

The late Major J. R. G. Gwatkin : An extensive collection of paintings of flowering plants, mainly British.

The Royal Society : Donation in aid of publications, £100.

The Percy Sladen Memorial Fund : Cost of printing and illustrating 'Transactions', 3rd ser., vol. i, part 2.

1941

The late Mr. Francis Druce : (1) £200 for general purposes of the Society ; (2) a selection of books from his library, including some rare early botanical works.

Rockefeller Foundation : Donation in aid of publications, £100.

Carnegie Corporation of New York, \$8,060, for the preparation of a photographic record of the collections and manuscripts of Carl Linnaeus.

The late Sir Arthur Evans : Portrait in oils of John Dionysius Ehret, F.R.S., by George James, A.R.A., 1767.

ADDITIONS AND DONATIONS

TO THE

LIBRARY

1940-1

Note.—Names of donors are given in square brackets. Separate copies of papers which are included in periodicals received by the Library are no longer catalogued.

- Abraham, J. J.** Lettsom. His life, times, friends and descendants. Pp. xx+498. 8vo. *London*, 1933.
- Axelrod, D. I.** A Miocene Flora from the Western Border of the Mohave Desert. Pp. 129. 8vo. *Washington*, 1939. [CARNEGIE INST.]
- Balfour-Browne, Frank.** British Water Beetles. Vol. 1. Pp. xx+375. (Ray Society Publication.) 8vo. *London*, 1940.
- Balfour-Browne, J.** See **British Museum (Natural History)**. Ruwenzori Expedition, 1934-5.
- Banta, A. M.** Studies on the physiology, genetics, and evolution of some Cladocera. Pp. x+285. 4to. *Washington*, 1939. [CARNEGIE INST.]
- Bennett, H.** See **British Museum (Natural History)**. The John Murray Expedition, 1933-4.
- Bernhauer, M.** See **British Museum (Natural History)**. Ruwenzori Expedition, 1934-5.
- Betten, Cornelius.** See **British Museum (Natural History)**. The Francis Walker Types of Trichoptera in the British Museum.
- Bierens de Haan, J. A.** Die Tierischen Instinkte und ihr Umbau durch Erfahrung. Pp. xi+478. 8vo. *Leiden*, 1940. [Dr. E. S. RUSSELL.]
- Bloomer, H. H.** British Anodonta and Pseudanodonta. (Collected reprints.) 8vo. [AUTHOR.]
- British Fern Gazette.** Vols. 1-6, 1909-35. [the late T. B. BLOW.]
- British Museum (Natural History).**
 Monograph of the South American Weevils of the Genus *Conotrachelus*. By KARL FIEDLER. Pp. v+365. 8vo. *London*, 1940.
 The Families and Genera of living rodents. By J. R. ELLERMAN. Pp. xxvi+689. 8vo. *London*, 1940.
 Second appendix to the catalogue of Meteorites. By M. H. HEY. Pp. 136. 8vo. *London*, 1940.
 The Francis Walker Types of Trichoptera in the British Museum. Re-described and figured by CORNELIUS BETTEN and M. E. MOSELY. Pp. ix+248. 8vo. *London*, 1940.
 Index of Palaeozoic coral genera. By W. D. LANG, STANLEY SMITH and H. D. THOMAS. Pp. vii+231. 8vo. *London*, 1940.
 Catalogue of the Books, Manuscripts, Maps and Drawings in the British Museum (Nat. Hist.). Vol. 8. Supplement P-Z. 4to. *London*, 1940.
 Great Barrier Reef Expedition, 1928-9. Scientific Reports. Vol. 1. No. 13. The biology of reef-building corals. By C. M. YONGE. Pp. 353-391. 4to. *London*, 1940.
 The John Murray Expedition, 1933-4. Scientific Reports. 4to. *London*, 1940.
 Vol. 2. No. 5. Chemical and Physical Investigations. The distribution of Hydrogen-ion concentration in the North-western Indian Ocean and adjacent waters. By A. F. MOHAMED. Pp. 121-202.

- Vol. 3, No. 4. The distribution of organic carbon and nitrogen in sediments from the Arabian Sea. By J. D. H. WISEMAN and H. BENNETT. Pp. 193-221.
- Vol. 6, No. 7. The Gorgonacea. By S. J. HICKSON. Pp. 267-317.
- Vol. 6, No. 8. Ostracoda. By H. GRAHAM CANNON. Pp. 319-25.
- Vol. 7, No. 2. Copepoda, Harpacticoida. By R. B. SEYMOUR SEWELL. Pp. 117-382.
- Vol. 7, No. 3. Cirripedia. By H. G. STUBBINGS. Pp. 383-99.
- Ruwenzori Expedition. 1934-5. 4to. *London*, 1940.
- Vol. 3, Nos. 6-10. Carabidae. By L. BURGEON. Carabidae Trechinae. By R. JEANNEL. Staphylinidae. By M. BERNHAUER. Hydrophilidae. By J. BALFOUR-BROWNE. Lycidae. By R. KLEINE.
- Vol. 2, No. 4. Muscidae: B.—Coenosiinae. By F. I. VAN EMDEN.
- Vol. 2, No. 5. Empididae: A.—Hybotinae, Ocydromiinae, Clinocerinae and Hemerodromiinae. By C. GARRETT JONES.
- Instructions for Collectors: No. 4 A. Insects. Pp. 164. 8vo. *London*, 1940.
[TRUSTEES, BRIT. MUS. (NAT. HIST.).]
- Burgeon, L. See *British Museum (Natural History)*. Ruwenzori Expedition, 1934-5.
- Cannon, H. Graham. See *British Museum (Natural History)*. The John Murray Expedition, 1933-4.
- Carpenter, T. M. Tables, factors, and formulas for computing respiratory exchange and biological transformations of energy. Ed. 3. Pp. 142. 8vo. *Washington*, 1939.
[CARNEGIE INST.]
- Carter, G. S. A General Zoology of the Invertebrates. Pp. xxviii+509. 8vo. *London*, 1940.
[AUTHOR.]
- Clements, F. E. See *Martin, E. V.*
- Cott, Hugh B. Adaptive Coloration in Animals. Pp. xxxii+508. 8vo. *London*, 1940.
- de Terra, H. Studies on the Ice Age in India and associated human cultures. Pp. xi+354. 4to. *Washington*, 1939.
[CARNEGIE INST.]
- Eggeling, W. J. The Indigenous Trees of the Uganda Protectorate. Pp. xxii+296. 4to. *Entebbe*, 1940.
[CONSERVATOR OF FORESTS, UGANDA.]
- Ellerman, J. R. See *British Museum (Natural History)*. The Families and Genera of living rodents.
- Emden, F. I. van See *British Museum (Natural History)*. Ruwenzori Expedition, 1934-5.
- Fiedler, Karl. See *British Museum (Natural History)*. Monograph of *Conotrachelus*.
- Hall, Sir A. Daniel. The Genus *Tulipa*. Pp. viii+171. 8vo. *London*, 1940.
[AUTHOR.]
- Harris, T. Y. Wild Flowers of Australia. Pp. xix+198. 8vo. *Sydney & London*, [1938].
- Hey, M. H. See *British Museum (Natural History)*. Second appendix to the catalogue of Meteorites.
- Hickson, S. J. See *British Museum (Natural History)*. The John Murray Expedition, 1933-4.
- Hubbard, C. E., & Vaughan, R. E. The Grasses of Mauritius and Rodriguez. Pp. 128. 8vo. *London*, 1940.
[CROWN AGENTS FOR THE COLONIES.]
- Hudson, G. Flora Anglica. Ed. 2. 2 vols. in 4. 8vo. *London*, 1778.
[the late T. B. BLOW.]
- Hyde, H. A., & Wade, A. E. Welsh Ferns. Pp. x+131. 8vo. *Cardiff*, 1940.
[NATIONAL MUSEUM OF WALES.]
- Jackson, A. Keith, & A. Bruce. See *Step, Edward*.
- Janse, A. J. T. The Moths of South Africa. Vol. 3. Text & atlas. Pp. xv+435. 8vo. *Durban & London*, 1939-40.
[AUTHOR.]
- Jeannel, R. See *British Museum (Natural History)*. Ruwenzori Expedition, 1934-5.
- Jones, C. Garrett. See *British Museum (Natural History)*. Ruwenzori Expedition, 1934-5.
- Just, E. E. The Biology of the Cell Surface. Pp. xi+392. 8vo. *London*, 1939.
- Kleine, R. See *British Museum (Natural History)*. Ruwenzori Expedition, 1934-5.

- Lang, W. D. *See* British Museum (Natural History). Index of Palaeozoic coral genera.
- Martin, E. V., & Clements, F. E. Adaptation and origin in the plant world. 1. Factors and functions in coastal dunes. Pp. viii+107. 8vo. *Washington*, 1939. [CARNEGIE INST.]
- Mohamed, A. F. *See* British Museum (Natural History). The John Murray Expedition, 1933-4.
- Mosely, M. E. The British Caddis Flies (Trichoptera). Pp. xiii+320. 8vo. *London*, 1939.
- *See* British Museum (Natural History). The Francis Walker Types of Trichoptera in the British Museum.
- Sewell, R. B. Seymour. *See* British Museum (Natural History). The John Murray Expedition, 1933-4.
- Sherborn, C. D. Where is the—Collection? Pp. 149. 8vo. *Cambridge*, 1940.
- Silveus, W. A. Texas Grasses. Pp. xlvii+782. 8vo. *San Antonio*, 1933. [I. A. WILLIAMS.]
- Smith, Stanley. *See* British Museum (Natural History). Index of Palaeozoic coral genera.
- Step, Edward. Wayside and Woodland Trees. Revised by A. KEITH JACKSON & A. BRUCE JACKSON. Pp. xxxviii+186. 8vo. *London*, 1940. [THE PUBLISHERS.]
- Stubbings, H. G. *See* British Museum (Natural History). The John Murray Expedition, 1933-4.
- Sutton, Eric A. *See* Swedenborg, Emanuel.
- Swedenborg, Emanuel. On the worship and love of God. Pp. lv+253. 8vo. *London*, 1885.
- Ontology. Pp. xvi+59. 8vo. *Boston*, 1901.
- The Infinite. Pp. lxxvii+235. 8vo. *London*, 1908.
- The Principia. 2 vols. Pp. cv+545; xxi+669. 8vo. *London*, 1912.
- The [Minor] Principia. Pp. xxii+237.
- The Genius of Swedenborg. By ERIC A. SUTTON. Pp. 39. 8vo. *London*, 1935.
- The Happy Isles: The story of Swedenborg. By ERIC A. SUTTON. Pp. xi+177. 8vo. *London*, 1938. [THE SWEDENBORG SOCIETY.]
- Thomas, H. D. *See* British Museum (Natural History). Index of Palaeozoic coral genera.
- Thompson, D'Arcy W. Science and the Classics. Pp. viii+264. 8vo. *London*, 1940.
- Vaughan, R. E. *See* Hubbard, C. E.
- Wade, A. E. *See* Hyde, H. A.
- Wiseman, D. H. *See* British Museum (Natural History). The John Murray Expedition, 1933-4.
- Yonge, C. M. *See* British Museum (Natural History). Great Barrier Reef Expedition, 1928-9.

ASSOCIATION FOR THE STUDY OF SYSTEMATICS IN RELATION TO GENERAL BIOLOGY

ANNUAL REPORT III (1940-1)

The second Annual Report of the Association was adopted at a General Meeting held on 29 May 1940 (published in *Proc. Linn. Soc.*, Session 152, 1939-40, Pt. 4, pp. 399-403).

Since then the activities of the Association have been mostly at a standstill owing to the war.

The Convener of the Research Committee (Dr. Turrill) reports as follows:—

Research at Potterne has been concluded and that at Kew has had to be reduced to a minimum. It is still hoped to complete the more important of the experiments in hand. In addition, a number of papers dealing with experiments concluded in 1939 and 1940 are in hand for publication as opportunity offers.

It is still hoped that the List of Works on the British Fauna and Flora prepared under the auspices of the Handbooks Committee may be published this year.

The other Committees have nothing to report, but remain in existence and prepared to deal with anything that may arise.

Up till 3 April 1941, 713 copies of the 'New Systematics' had been sold.

A joint meeting with the Zoological Society of London was held at the Society's rooms in Regent's Park on 11 June 1940, the subject being Taxonomy and Paleontology.

Since June 1940, when Dr. Parker took up work with the Admiralty, Dr. Anna Hastings has been acting as Zoological Secretary.

J. S. L. GILMOUR,
Hon. Botanical Secretary.

ANNA B. HASTINGS,
Acting Hon. Zoological Secretary.

Treasurer's Statement.

BALANCE SHEET AS AT 20 MARCH 1941

CREDITS.			DEBITS.		
	£	s. d.		£	s. d.
Special Fund (Founder Member)	5	0 0	Oxford Press ('New Systematics')	9	16 1
Late Subscriptions for 1939-40	15	0	P.O. Savings Account (Special Fund)	92	0 0
Subscriptions, 1940-1 ..	5	5 0	Balance at Bank	32	1 3
Subscriptions, 1941-2 (paid in advance)		5 0			
Receipts for 'New Systematics,	8	8 6			
Balance from last account.	114	3 10			
	£133	17 4		£133	17 4

The difference between the receipts and payments on account of 'The New Systematics' with the Oxford Press is due to payment for one copy, the cash for which was received during the last financial year, and a copy paid for by the Association, but for which, at the time of making the balance, payment had not been received by the Association, and alterations in postages which have not been charged against members. Mr. Biswas continues to owe the Association 11s. 9d. on account of a copy of 'The New Systematics' sent to him on credit.

The balance at the Westminster Bank includes £7 15s. 0d. of paid-in-advance subscriptions for 1941-42 and 1942-43. The balance on the year's working is, therefore, £24 6s. 3d. At the time of striking the balance the cost of printing the annual report for 1939-40, the Hon. Secretary's expenses and the Hon. Treasurer's expenses were still outstanding liabilities. As to outstanding assets, there were, at the time of balance, several members who had not paid up their 1940-41 subscriptions. (The credit balance for last year's workings was £11 18s. 10d.)

The Special Fund. This now amounts to £92 0s. 0d., and is in the P.O. Savings Bank; no interest yet received. The Trustees of this Fund are Prof. Tansley and Dr. C. Forster-Cooper.

Membership. On 8 July 1941 there were 11 Founder Member and 83 Ordinary Members.

JOHN SMART,
Hon. Treasurer.

British Museum (Natural History),
Cromwell Road, London, S.W. 7.

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ERRATUM.

p. 244, line 12 from bottom for T. F. Brooks, read F. T. Brooks.

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